Food and Agriculture Organization of the United Nations

LOCUST CRISIS



MADAGASCAR

Response to the locust plague
Programme – Campaign n° 3

September 2015 to June 2016

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ACRONYMS AND ABBREVIATIONS

CALAT	Support Unit for Anti-Locust Ground Control (*Cellule d'appui à la lutte antiacridienne terrestre*)
CFSAM	Crop and Food Security Assessment Mission
CIPA	Coordination of anti-locust parallel interventions (*Coordination des interventions parallèles antiacridiennes*)
CNA	National Anti-Locust Centre (*Centre national antiacridien*)
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
GIS	Geographical Information System
IGR	Insect Growth Regulator
PGSE	Human Health and Environment Management Plan (*Plan de gestion sanitaire et environnementale*)
PSMS	Pesticide Stock Management System
WFP	World Food Programme

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SUMMARY

Madagascar is prone to natural disasters including drought, floods, cyclones and locust crises. The current locust plague began in April 2012 following a two-year upsurge that was not addressed because of insufficient means. Given the extent of the plague and Madagascar's high rates of food insecurity and malnutrition, it was estimated that the food security of 13 million people (60 percent of the population) could be affected in the absence of large-scale locust control operations. To cope with this dire situation, the Ministry of Agriculture of Madagascar and the Food and Agriculture Organization of the United Nations (FAO) developed a Three-year Programme (2013–2016) in response to the locust plague in December 2012.

Given the magnitude and geographical extent of infested and contaminated areas, it was estimated that at least three successive anti-locust campaigns would be required to return to a locust recession situation, as follows:

- **Anti-Locust Campaign 1:** fight against the plague, from September 2013 to August 2014.
- **Anti-Locust Campaign 2**: measures to support the anticipated decline, from September 2014 to August 2015.
- **Anti-Locust Campaign 3**: towards locust recession and capacity building of the National Anti-Locust Centre (CNA), from September 2015 to June 2016.

The objective of the Programme is to contribute to safeguarding food security of the most vulnerable rural populations in Madagascar. Its five components are:

1. Strengthening national capacities to monitor and analyse locust situations.
2. Strengthening national locust control capacities.
3. Preserving human health and protecting the environment.
4. Implementing and coordinating the Programme.
5. Assessing the effectiveness of the anti-locust campaigns and the impact of the locust crisis on crops and pastures.

In December 2012, the Three-year Programme's budget was estimated at USD 41.5 million. This estimated budget was to be revised annually to reflect the evolution of the locust situation, the requirements of each anti-locust campaign and the exact cost of the various items. Adjusted at the start of the first campaign, in September 2013, and again in June and December 2014 (taking into account the estimated and actual cost of the first campaign and the provisional cost of the second), the budget was updated in June 2015, based on the estimated cost of the second campaign and the provisional cost of the third. In June 2015, this estimated budget totalled USD 37 million[1] for the entire Programme.

The first and second anti-locust campaigns were fully funded (despite some difficulties during the second campaign to obtain the necessary funding in time) and successfully implemented. Survey and control operations, mostly aerial, conducted from September 2013 to August 2015 (Campaign 2's operations ended on 15 August) allowed locust populations to be controlled over more than 1.8 million hectares (1.2 million ha during the 2013/14 campaign and 640 000 ha during the 2014/15 campaign) in the respect of human health and the environment. Thanks to the implementation of these operations, the specific objectives of the first and second anti-locust campaigns (namely the fight against the locust plague and the support of the anticipated decline of the plague) were achieved and crops and pastures have been protected,

[1] This budget will be adjusted as soon as the actual cost of the second campaign has been calculated.

thus contributing to safeguarding the food security of rural populations in Madagascar, which is the ultimate objective of the Three-year Programme.

Before the launch of Three-Year Programme in response to the locust plague, it was emphasized how essential it was to obtain timely all the required funding in order to return to a locust recession situation in 2016 and neither delay the implementation of each of the three anti-locust campaigns nor lose from one campaign to the next one the benefits of the efforts made. **If the third anti-locust campaign cannot be carried out in its entirety and in a timely fashion, the return to a recession situation cannot be guaranteed in June 2016; a situation of chronic locust upsurge could prevail (as was the case from 2010 to 2012), exacerbating sooner or later into a new plague.**

This document is in line with the strategy defined in the Three-year Programme, it follows the programme closely and is a direct result of it. Moreover, it duly includes all the necessary technical adjustments made during the course of the second campaign to take into account the results achieved and progress made as well as the recommendations put forward during the two previous campaigns and the lessons learnt. It describes the third anti-locust campaign, to be conducted in 2015/16, whose specific objective is to return to a locust recession situation through the implementation of aerial control operations in all infested areas, although on a lesser scale than during the two previous campaigns. The expected outcomes, indicators and activities are described by component. Also presented below are the management modalities carried out by FAO in close collaboration with the Ministry of Agriculture, the technical and operational support provided for Programme implementation, project inputs, the monitoring and evaluation system and the nature and periodicity of reports.

1. GENERAL INFORMATION

1.1. Sectorial Context

Madagascar is particularly prone to natural disasters including drought, floods, cyclones and locust crises. The humanitarian consequences can be particularly serious because Madagascar is one of the poorest countries in the world, ranking 155th out of 187 countries in the 2014 Human Development Index. Poverty and food insecurity, which affect the country dramatically, mainly concern rural areas and more specifically the south-west part of the Island which corresponds to the Outbreak area of the Malagasy Migratory Locust and the starting point for its plagues: according to the World Bank[2], the proportion of people living below the poverty line (less than two dollars a day) reached 92 percent in May 2013. The Special Report of the Crop and Food Security Assessment Mission (CFSAM) to Madagascar conducted by FAO and the World Food Programme (WFP)[3] and published in October 2014 indicates that approximately 36 percent of rural households suffered from food insecurity in the 14 regions covered by the survey[4], i.e. 8 percent more than in the survey conducted by CFSAM in 2013[5]. The prevalence of severely food insecure households continues to be higher in the southern part of the country, particularly in the Androy and Atsimo Andrefana regions. According to the report, the increased rate of food insecurity in Madagascar could be due to the prolonged impact of Cyclone Haruna, population growth, the unprecedented impact of precipitation and, since 2012, the plague[6] of the Malagasy Migratory Locust [*Locusta migratoria capito* (Saussure, 1884)].

In early 2015, the floods that followed the tropical storms Chedza and Fundi, in January and February respectively, and the drought that struck the south of the country exacerbated the already fragile food security of the rural population. In March 2015, the "Food Security and Livelihood" cluster conducted two brief assessments to measure the extent of the damage caused by the disasters. According to the assessment of the floods' impact, approximately 230 000 people living in the worst-affected regions (Mid-West, *Hautes-Terres* and the southeastern part of the country) required urgent food assistance. The drought assessment indicated that the rainfall deficit affecting the 2014/15 growing season resulted in an increase in the number of severe food insecurity cases, particularly in the Androy and Atsimo Andrefana regions, where 41 percent and 34 percent of households respectively suffer from severe food insecurity compared with 27 percent and 11 percent in 2014 and 16 percent and 9 percent in 2013 (CFSAM).

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[2] Website of the World Bank in Madagascar: "*Measuring the impact of the Political Crisis*", 5 June 2013, www.worldbank.org/en/news/feature/2013/06/05/madagascar-measuring-the-impact-of-the-political-crisis

[3] Special Report, FAO/WFP Crop and Food Security Assessment Mission to Madagascar, 23 October 2014.

[4] The 14 regions surveyed are: Alaotra Mangoro, Amoron'I Mania, Androy, Anosy, Atsimo Andrefana, Atsimo Atsinanana, Boeny, Bongolava, Itasy, Melaky, Menabe, Sofia, Vakinankaratra and Vatovavy Fitovinany.

[5] Special Report, FAO/WFP Crop and Food Security Assessment Mission to Madagascar, 9 October 2013.

[6] A locust plague is characterized by severe and widely distributed infestations, most of which being in the form of hopper bands and adult swarms. The entire Invasion Area, well beyond the Outbreak Area, is then infested over a period of one year or more.

These households also live under the constant threat of the Malagasy Migratory Locust. It is therefore essential that locust numbers are controlled to support these households and to allow agricultural production to resume.

1.2. Locust and anti-locust contexts

After a successful first anti-locust campaign (2013/14) that enabled the dynamics of the Malagasy Migratory Locust plague to be halted, the second anti-locust campaign (2014/15) was officially launched on 9 October 2014 with the start of extensive aerial survey operations. These first surveys covering the western side of Madagascar (from Majunga to Toliara) led to:

- identifying and localizing hotspots of the locust populations that had survived the winter period and would become the parental generation of the first rainy season breeding during;
- confirming observations made at the end of the first campaign (August 2014), namely the importance of residual populations. The situation was very different from that of the same period in 2013 because persisting grouped populations were fewer and less dense and the overall level of locust infestations across the Island had fallen sharply thanks to the large-scale aerial control operations carried out during the previous anti-locust campaign (2013/14);
- determining where to deploy the two aerial bases, each equipped with one helicopter for survey and control. The first base was established in Tsiroanomandidy on 13 October 2014 and the second in Ihosy on 20 October 2014.

The end of the winter period was marked by the the first rains as early as late September 2014. Most locust populations had reached sexual maturity and started breeding. In October, the rains continued, resulting in the regrowth and greening of the vegetation and in a first replenishment of soil water reserves. However, some regions of southwest Madagascar remained very dry and subject to bushfires. From the second half of October 2014, hatching had begun and hoppers were forming bands. Control operations started in the Invasion Area on 17 October 2014, allowing the elimination of a large number of hopper patches and bands. The hopper populations that had escaped control operations formed some swarms and light flights on the western side of the Invasion Area. In the Outbreak Area, conditions remained generally unfavourable for Malagasy Migratory Locust breeding until early December.

In December 2014, the locust populations observed in the central part of the Invasion Area (Betsiriry Plain) were gregarious and present as hopper patches and bands. Fledging then occurred for undetected or untreated hopper populations and young adults of the first generation appeared. In the northwest of the Outbreak Area (Manja area) the locust populations observed were highly heterogeneous (hoppers of all instars to adults) and in *transiens degregans* phase. The presence of such population confirmed the start of the decline of the locust plague.

The second generation of Malagasy Migratory Locust breeding began towards the end of the first ten days of January 2015. At the end of the second ten-day period, the extreme weather conditions accompanying the tropical storm Chedza affected the Invasion Area and part of the Outbreak Area (up to Manja); consequently, the operations of the two aerial bases, respectively deployed in Miandrivazo (Invasion Area) and Manja (Outbreak Area), were interrupted for a few days.

In February 2015, the tropical storm Fundi severely hit almost the entire western side of the Island; the operations of the aerial bases, deployed in Miandrivazo (Invasion Area) and Toliara, were once again interrupted for a few days. The strong winds associated with the Fundi storm resulted in the spatial redistribution of winged Malagasy Migratory Locust populations and favored their movements towards non-flooded areas, where the weather and ecological conditions were favourable for breeding. In the central part of the Invasion Area (Betsiriry Plain), the locust populations were gregarious and present as light flights and swarms of immature adults. In the Outbreak Area, most of the locust populations (70 percent) were scattered and highly heterogeneous (all instars and phases). However, in the northwest (Manja area), important grouped populations consisting of gregarious late-instar hopper bands mixed with young immature adults were reported and immediately treated.

From 10 March 2015 onwards, rainfall generally dropped over the entire Island. Vegetation thus began to dry out on the uplands and plains but remained green in low-lying areas. In the central part of the Invasion Area (Mandoto area), the light flights and small swarms observed in early April laid eggs in mid-April before being controlled, which resulted in third generation gregarious hopper patches and bands. In the Outbreak Area, the locust situation continued to be highly heterogeneous. In the southwest (Bekily-Fotadrevo peneplain, Mahafaly plateau and arc and coastal plain), the locust populations observed during the last ten days of March 2015 were scattered and consisted of different instar hoppers and of *transiens* adults. In the northwest (Morombe area) and central (Tsitondroina area and Belomatra plateau) parts, the populations observed from mid-April to early May formed groups. Gregarious hopper patches and bands as well as light flights and small swarms were then localized and controlled.

The cool and dry season gradually set up from 10 May 2015. Temperatures were very low in the highlands but, on the contrary, remained favourable for locust development in the lowlands and in the *Hautes-Terres* areas. From 11 to 20 May 2015, grouped populations of the Malagasy Migratory Locust consisting of hopper bands and swarms were localized and controlled in the central part of the Invasion Area (Mandoto and Malaimbandy areas) and in the central part of the Outbreak Area (Ikalamavony area). From 21 to 31 May 2015, adult populations consisting of moderately dense swarms of young adults prevailed in both the Invasion and Outbreak Areas, and were treated.

In June and July 2015, the cool and dry season was established throughout the entire Island. Temperatures dropped and there was no or little rain, which slowed down the Malagasy Migratory Locust development. Grouped populations, mainly in the form of light flights and swarms, were present at the edge between the central part of the Invasion Area (Betsiriry Valley) and the northwest of the Outbreak Area (Morondava plain). Hopper patches and bands of all instars were still present as of 10 July 2015 in the east of the Outbreak Area (Zomandao plain). By the end of July, only a few grouped populations of Malagasy Migratory Locust adults persisted in the above-mentioned areas; they were localized and controlled.

In early August 2015, the weather and ecological conditions were similar to those that prevailed in July, maintaining the Malagasy Migratory Locust in reduced biological activity. Some small grouped adult populations in the form of light flights were observed in the central part of the Invasion Area (Mandoto area) and were treated. At the end of August, temperature increase led to longer daily flights of residual adult populations in search of favourable habitats, both in the Outbreak (Bekily-Fotadrevo peneplain) and the Invasion Areas (Mandoto area). In some areas (between Mandoto and Ihosy), emergence of the first vegetation regrowth (owing to inter-season rains) after the bushfires was observed, which could result in appearance of

habitats favourable for the Malagasy Migratory Locust breeding. The Mandoto-Ihosy axis therefore required increased surveillance at the start of the third and final campaign of the Three-year Emergency Programme (2013–2016) in response to the locust plague.

During the 2014/15 anti-locust campaign, weather and ecological conditions were generally favourable for the Malagasy Migratory Locust despite the late arrival of the first rains in the Outbreak Area in early December 2014 and the passage of two tropical storms (Chedza and Fundi) in early 2015. As of 15 August 2015, the significant efforts that were made allowed the control of locust populations over a total area of more than 640 000 ha (see Annex 2, Table 1), i.e. 77 percent of infested areas according to the bulletins published by the Locust Watch Unit every ten days. According to the assumptions made for Campaign 2, a total surface of 800 000 hectares was planned to be treated, 29 percent of which with conventional pesticides (full cover treatments against swarms or late-instar hopper bands) and 69 percent with an Insect Growth Regulator ([IGR], barrier treatments against hopper bands up to the third instar) and 2 percent with biopesticides (full cover or barrier treatments). As of 15 August 2015, the treated areas accounted for 80 percent of the estimated total area to be treated. The difference of 160 000 ha between the estimated target (800 000 hectares to be treated) and the actual treatment (over 640 000 ha) was due to the lack of information in some areas (in particular in the Outbreak Area that should have been covered by the CNA) throughout the campaign and to interruptions of aerial treatment because of aircraft malfunction. In total, 28 percent of control operations were carried out using the full-cover technique (26.5 percent with conventional pesticides and 1.1 percent with biopesticide) and 72 percent with IGRs as barrier treatment; therefore, treatments were carried out in accordance with the strategy of the Three-year Programme that encourages, whenever possible, control operations against hopper bands. In total, more than 170 000 litres of conventional pesticides, 87 000 litres of IGRs and 365 kg of biopesticide were used (see Annex 2, Table 3).

These results were achieved through the deployment of two aircraft dedicated to both survey and control operations. It should be noted that no treatment can be carried out in the absence of preliminary aerial surveys allowing access to all areas that can be settled by the Malagasy Migratory Locust (where it can breed and develop) to identify targets for treatment (sometimes hidden in growing vegetation, or highly mobile); such areas, given the complex topography of the land, are often inaccessible by road especially during the rainy season. Two types of survey are conducted: extensive surveys to localize population hotspots, gather information to understand the dynamics of locust populations, establish assumptions and optimize the deployment of aircraft, and intensive surveys to identify and define blocks to be treated. The aerial bases were redeployed as often as necessary in order to be as close as possible to locust hotspots whose successive locations evolve throughout the rainy season according to its characteristics and the way in which the locust reacts to the environmental changes of its habitat.

In total, almost 1 540 helicopter flying hours were required from 17 October 2014 to 12 July 2015 to complete the second anti-locust campaign (2014/15); 48.7 percent of these (749 hours) were devoted to surveys, 35.4 percent (almost 546 hours) to control operations (set-up and spraying) and 15.9 percent (almost 245 hours) to movements (deployment, redeployment and conveyance). Almost half of all flying hours were thus used for surveys (see Annex 2, Table 2) because of the locust situation of this second campaign. Indeed, during a

recession period, grouped locust populations are fewer, smaller and more scattered, therefore more time is needed to localize them.

The ground survey and control operations conducted throughout the second campaign to support aerial operations were halted on 15 August 2015. Indeed, during their surveys, the two ground teams observed a very sharp fall both in the number of reports from rural populations and in the importance of grouped locust populations.

The 2014/15 campaign also contributed to strengthening national capacities through specific training provided in different technical fields, completed by on-the-spot practical training delivered by the various experts present in the field on a permanent basis.

In conclusion, at completion of the second campaign, the overall infestation level had decreased as indicated by the reduction of areas infested by grouped populations of the Malagasy Migratory Locust and their phase status: the infested areas represented 48 percent of the territory in 2013/14 compared with only 28 percent in 2014/15 (see maps in Annex 1); overall, the phase status evolved from gregarious to *transiens*. The objectives of the second campaign were thus reached: the decline of the Malagasy Migratory Locust plague was confirmed, crops and pastures were protected and no incidents with regard to human health and the environment were reported.

The preliminary conclusions of the assessment mission of the second anti-locust campaign (2014/15) confirm this analysis. The conclusions underline the success of the Three-year Programme in response to the locust plague in Madagascar thanks, especially, to effective survey operations: both locust numbers and the geographic extension of grouped locust populations were significantly reduced. Thus they indicated that the objectives of the second campaign were achieved (confirmed decline of the plague, crops and pastures protected and no incidents regarding human health and the environment reported) based on the findings of the first campaign, positive feedback from people encountered and observations made in the field. Lastly, they emphasize the absolute necessity of continuing the efforts made so far during a third campaign (2015/16) to reach the final objective of returning to a locust recession situation[7].

1.3. Impact of the locust plague on food security and justification for the response

The locust plague occurs in a context of high food insecurity and malnutrition levels. Agriculture employs 80 percent of families on nearly 2.5 million farms, and accounts for 27 percent of gross domestic product (GDP) and 47 percent of the primary GDP (1984–2005). Rural farmers, as well as the rest of the population, are especially vulnerable because of the subsistence nature of their livelihoods. Moreover, farming households' resilience is very low as a result of insufficient or no reserves, a lack of collective storage structures and widespread poverty, which, in recent years, has undermined the villages' solidarity networks. Even a small amount of damage to crops will inevitably have a deeply destabilizing effect on households' livelihoods and food security.

For this reason, CFSAMs should pay particular attention to the impact of locusts on food security.

[7] A recession is a period without widespread and heavy infestations of the Malagasy Migratory Locust in the Outbreak Area, and, *a fortiori*, over the entire country.

Since the start of the Three-year Programme, two CFSAMs have been conducted coinciding with the end of the first and second anti-locust campaigns: one in June/July 2014 and the other in July/August 2015. The 2014 CFSAM report, published in October 2014 and available on line[8] concluded that the first anti-locust campaign fulfilled its role to prevent major damage to crops and pastures; the effectiveness of large-scale aerial control operations implemented by FAO prevented the progression of the locust plague towards the major rice-growing areas, thus saving the country from a serious food crisis. Without these control operations, the crops would have been destroyed by locusts.

The preliminary findings of the 2015 CFSAM report indicate that locust damage to grain production in 2015 was negligible at a national scale, the plague having been largely contained thanks to the implementation of the 2014/15 anti-locust campaign. Data show that the fall in rice production recorded in 2015 was mainly due to unfavourable weather conditions (drought and two tropical storms at the beginning of 2015). Although damage caused by locusts was reported, especially in the South (particularly in the Atsimo Andrefana region), the aerial and ground operations of the 2014/15 campaign, in addition to the impact of the interventions conducted since September 2013, prevented major harvest losses in 2015.

The implementation of the Three-year Programme (2013–2016) in response to the locust plague contributed to the reduction in numbers and gregariousness of locust populations as well as geographical extent of locust infestations. As a result, damage to crops and pastures caused by locusts since the Programme's launch was limited. In order not to compromise the results obtained over the course of the first and second campaigns, it is essential to complete the Three-year Programme in order to return to a recession situation in 2016. This will enable to stop a cycle of major locust crises, thus avoiding the exacerbation of an already pronounced food insecurity situation.

[8] FAO/WFP Crop and Food Security Assessment Mission to Madagascar, 23 October 2014.

2. THE THREE-YEAR PROGRAMME IN RESPONSE TO THE LOCUST PLAGUE (2013–2016)

2.1. Objectives, beneficiaries, components and indicative budget

The **main objective** of the Three-year Programme in response to the locust plague (2013–2016) is to contribute to safeguarding food security for the most vulnerable rural populations in Madagascar.

The direct beneficiaries of the Three-year Programme are rural populations living in areas infested by locusts, whose harvests will be protected.

Considering the magnitude and geographical scope of the infested and contaminated areas, it is estimated that at least three successive anti-locust campaigns are necessary to return to a locust recession period, as follows:

- **Anti-Locust Campaign 1:** fight against the plague, from September 2013 to August 2014 (more than 1.2 million hectares treated);
- **Anti-Locust Campaign 2:** measures to support the anticipated decline, from September 2014 to August 2015 (more than 640 000 hectares treated);
- **Anti-Locust Campaign 3:** towards locust recession and strengthening the capacity of the National Anti-Locust Centre (CNA), from September 2015 to June 2016 (300 000 to 400 000 hectares to be treated)[9].

The Three-year Programme in response to the locust plague is based on five components:

1. Strengthening national capacities to monitor and analyse locust situations.
2. Strengthening national locust control capacities.
3. Preserving human health and protecting the environment.
4. Implementing and coordinating the Programme.
5. Assessing the effectiveness of anti-locust campaigns and the impact of the locust crisis on crops and pastures.

In December 2012, the budget of the Three-year Programme (2013–2016) was estimated at USD 41.5 million. This estimated budget was to be revised annually to reflect the evolution of the locust situation, the requirements of each anti-locust campaign and the exact costs of inputs. It has therefore been adjusted several times. Adjusted a first time at the beginning of the Programme in September 2013, the estimated budget was updated in June 2014 and then again in December 2014 to take into account the actual cost of the first campaign and the provisional cost of the second: it was then assessed at USD 39.4 million. The budget was again updated in June 2015, taking into account the estimated cost of the second campaign and the provisional cost of the third (it will be readjusted as soon as the real cost of the second campaign is known).

[9] When the Three-year Programme was being prepared, the available data, knowledge and experience resulted in the estimation of a surface area of 2.1 million hectares to be treated over the course of three anti-locust campaigns, divided as follows: 1.5 million ha during the first campaign; 500 000 ha during the second, reassessed to range from 500 000 to 800 000 ha in the document specific to this campaign, and 150 000 ha during the third campaign. With regard to the reassessment of the areas to be treated during the third campaign, see Section 3.2. Adopted strategy.

Table 1 provides the breakdown of the Three-year Programme's budget (June 2015) by component and by campaign.

Table 1: Budget (in USD million) of the Three-year Programme by component and by campaign (June 2015)				
SUMMARY	**CAMPAIGN 1 (2013/14)**	**CAMPAIGN 2 (2014/15)**	**CAMPAIGN 3 (2015/16)**	**TOTAL**
Component 1: Strengthening national capacities to monitor and analyse the locust situation.	5.07	2.78	1.85	**9.7**
Component 2: Strengthening national locust control capacities.	12.13	4.59	3.06	**19.78**
Component 3: Preserving human health and protecting the environment.	0.18	0.23	0.84	**1.25**
Component 4: Implementing and coordinating the Programme	2.78	1.90	1.43	**6.11**
Component 5: Assessing the effectiveness of the anti-locust campaigns and the impact of the locust crisis on crops and pastures.	0.05	0.05	0.06	**0.16**
TOTAL	**20.21**	**9.55**	**7.24**	**37**

It is essential that all required funds for the Three-year Programme are available in order to return to a locust recession situation.

2.2. FAO's comparative advantage

As part of its mandate to fight hunger in the world, provide technical assistance to governments to develop and implement effective agricultural policies and strengthen production capacities, FAO has been active in Madagascar for many years.

In the locust field, FAO has developed unique expertise in various regions in the world in both developing and implementing the preventive control strategy and managing locust crises, in collaboration with other United Nations agencies and various technical and financial partners.

In Madagascar, FAO played a key role in controlling the 1997–2000 locust plague. Recently, FAO conducted two large-scale campaigns against a locust upsurge (in 2010/11 and 2011/12); however, as these campaigns lacked sufficient resources, a new locust plague began in April 2012, which FAO reported to its technical and financial partners. In June 2012, in order to mobilize the Government and donors, FAO helped defining the prerequisites for external assistance and then, from December 2012 (following the official request for assistance from the Government of Madagascar), FAO worked to develop a Three-year Programme in response to the locust plague. In this context, FAO has successfully conducted the first and second anti-locust campaigns of the Three-year Programme, which must be completed by a third campaign, a crucial condition for achieving the Programme's objectives, i.e. a return to a locust recession situation.

Based on its experience in developing and implementing preventive control strategies, FAO also conducted an institutional and technical study on locust management in Madagascar (2011) aimed at identifying the strengths and weaknesses of the CNA as well as the problems

encountered for the sustainability of the preventive strategy; and making relevant recommendations by capitalizing on the work carried out to date. Upon return to a locust recession situation, the main challenge for Madagascar will be the effective implementation of an efficient and sustainable preventive control strategy.

FAO's added value is based on:

- unrivalled technical expertise in locust management, including in-depth knowledge of the one prevailing in Madagascar;
- a long-standing tradition of collaboration with the technical services of the Ministry of Agriculture of Madagascar;
- an efficient organizational and logistical infrastructure for crisis management;
- consolidated relations with many donors, which facilitates the rapid mobilization of financial resources for the implementation of large-scale actions.

2.3. Factors assuring sustainability

Strengthening institutional and technical capacities

The Three-year Programme in response to the locust plague was prepared in close collaboration with the Ministry of Agriculture (from which the official request for assistance originated) in order to respond to national needs to tackle the locust plague. Interventions are therefore consistent with current policies and strategies of the Government, for which the locust crisis remains a major challenge. The interventions must be integrated into ongoing development actions to ensure the sustainability of the process after the Programme's completion. Thus, while the 2013/14 campaign's objective was to stem the plague and the second campaign in 2014/15 to support its decline, the 2015/16 campaign is essential to ensure a return to locust recession and further strengthen national anti-locust management capacities. Only the long-term commitment of the Government and technical and financial partners can help counter the recurrence of locust crises, which are neither seasonal nor inevitable events.

These are crucial conditions for the effective implementation of a preventive control strategy. Discussions along these lines have already been initiated by the technical services of the Ministry of Agriculture and FAO, based on achievements and lessons learned from past experiences. The CNA must be reformed in order to be able to implement an effective and sustainable preventive control strategy as soon as the plague ends. This includes the annual funding for its operations and human and material resource management, including the maintenance and replacement of the equipment required for monitoring and controlling locusts and training for agents.

By then, over the course of the Three-year Programme, the activities implemented will contribute to the development of national capacities in data monitoring and analysis, management and implementation of locust survey and control operations, and monitoring the impact of control operations on human health and the environment. Furthermore, with the completion of the Programme, the National Locust Emergency Plan, validated by the Council of the Government on 24 September 2014, could be improved with any feedback that may be offered.

Environmental aspects

Within the framework of the Three-year Programme, in September 2013, FAO developed a Human Health and Environment Management Plan. This plan includes the assessment of risks and mitigation measures, procedures for health and environmental impact monitoring,

pesticide management and the provision of information on locust control operations. It is a dynamic document that will not only be used as a reference in the fight against the plague (Three-year Programme) but will also be useful in coming years to implement the preventive control strategy.

More specifically, with regard to the use and management of pesticides (a major concern for all stakeholders), it is clear that during a locust plague and on account of the magnitude of infested areas, the use of large quantities of pesticides is essential. In particular, the use of conventional, broad-spectrum, fast-acting pesticides is necessary against mobile locust populations (swarms) or those directly threatening crops. However, in order to limit the environmental impact of locust control operations, and especially to reduce the quantities of pesticides that are either in circulation or stored (and at risk of expiring), the 'triangulation' of pesticides, developed by FAO over the past years and whereby a country with a stock of pesticides donates part of it to a beneficiary country – with FAO providing transport – is used as far as possible. It should be noted, however, that locust control operations target hopper populations, which occupy smaller areas than adult (winged locust) populations, move more slowly and are more vulnerable to pesticides. IGR, which are slower-acting and have a narrower spectrum than conventional pesticides, can be used against hoppers because they act only on moulting insects. Moreover, since the effects of IGRs are long lasting, they can be applied in barriers (a sprayed swath every 500 to 1 000 metres) thus allowing the rapid protection of large areas infested by hopper bands. Lastly, non-chemical pesticides formulated with *Metarhizium acridum*, an entomopathogenic fungus specific to locusts, are used in environmentally sensitive areas. Every effort will be made to prevent pesticide stocks from becoming obsolete in Madagascar.

3. DETAILED PRESENTATION OF THE 2015/16 ANTI-LOCUST CAMPAIGN

3.1. Objectives

With the overall objective of helping to safeguard the food security of the most vulnerable rural populations in Madagascar, the specific objectives of the 2015/16 campaign are to return to a locust recession situation and to strengthen national capacities in anti-locust management.

In practice, achieving this objective will result in a new and significant decline of the geographical extension of the area settled by Malagasy Migratory Locust populations, which should no longer be observed beyond the edge of the Outbreak Area, their permanent habitat, and, at the same time, will lead to a decrease in the gregariousness of locust populations and the disappearance of hopper and adult grouped populations.

3.2. Adopted strategy

The strategy implemented to respond to the plague includes identifying locust populations' hotspots and regularly monitoring the dynamics of these populations in order to establish the most accurate diagnosis and forecast and be able to deploy and use available control measures according to best agricultural practices and with respect to human health and the environment.

In the plague context prevailing in Madagascar, this strategy involves control operations with different types of pesticides, taking into account the list of approved pesticides registered in the country, the latest report of the Pesticide Referee Group (composed of independent experts) as well as locust targets and various habitats. Two types of chemical pesticides and a biopesticide will be used: conventional fast-acting pesticides for full cover treatments (used mainly against winged locusts when rapid mortality is necessary, particularly if they are located near crops, or to prevent them from moving to other areas); IGRs for barrier treatments (for rapid protection of large areas contaminated by hopper bands of 1st to 3rd instar, thus preventing the formation of new swarms); and biopesticides formulated from the spores of the entomopathogenic fungus *Metarhizium acridum*, used for full cover or barrier treatments (especially in environmentally sensitive areas). The treatments primarily target hopper infestations.

The total quantity of pesticides to be purchased for the third campaign corresponds to the amount required for anti-locust treatments over an area of 300 000 to 400 000 hectares. The basic assumption made for the 2015/16 campaign is cautious, envisaging the treatment of a surface area far greater than that indicated when the Three-year Programme was developed in December 2012. The reason for this is the need to take into account the locust evolution from previous campaigns (highly dependent on weather and ecological conditions) and the results achieved during these campaigns. Moreover, the non-negligible fact of the persistent lack of information with regard to the Outbreak Area (the traditional habitat of the Malagasy Migratory Locust) is also to be considered, which should be covered by the CNA, the inaccessibility of some areas because of insecurity and logistical constraints (ground support, essential for the implementation of aerial operations, may not always be able to follow operations closely, thereby limiting them) and the characteristics of locusts, which are extremely opportunistic and react to ecological conditions.

Due to the extent of contaminated and potentially infested areas during a plague –including during its decline-, their location and the spatial-temporal evolution of the dynamics of locust populations, large-scale aerial operations are required. It is absolutely crucial to stick to this

strategic approach, namely the realization of large-scale aerial operations, in order to complete successfully the fight against the locust plague during the 2015/16 campaign. These operations will allow: 1) the collection of data on the status and dynamics of the locust populations in all infested areas and the identification of the most infested areas during extensive surveys; 2) the prioritization of areas to be treated during intensive surveys; and 3) the implementation of control operations in the concerned areas. The areas to be treated are so vast (estimated at between 300 000 and 400 000 hectares for the third campaign) that only aerial treatments are able to carry out timely and appropriate sprayings. They also enable the most remote areas to be reached, which are inaccessible by ground during the rainy season. Consequently, the total number of flying hours for the third campaign is estimated at 800 hours, of which 320 hours will be required for survey operations that play a crucial role in implementing the locust control strategy and its tactical adjustments, and 480 hours for locust control operations, i.e. 40 percent of hours for surveys and 60 percent for spraying operations. This ratio corresponds to an assumption that takes into consideration the need for more survey flying hours once the plague has declined because grouped gregarious populations become smaller, fewer and more dispersed and thus more difficult to find, as well as the effective ratio between survey and spraying flying hours during the second campaign; for example, this will be the case for hopper bands, already less visible than adult populations (since they move through the vegetation, which is often high and dense in the rainy season) and reported far less frequently than swarms by rural populations.

As part of this strategy, and as was the case during the implementation of Campaigns 1 and 2, tactical adjustments will be needed to respond to the evolving and dynamic nature of the locust plague. These adjustments could have an impact on the number of flying hours and their allocation (more specifically, on the ratio of survey and spaying flying hours), the quantities of pesticides used and the number of hectares treated. Priority will still be given to barrier treatments against hoppers but the difficulty in finding appropriate targets could lead to full-cover aerial spraying of grouped adult populations, which are more visible and reported more frequently, and which require more flying hours than barrier treatments.

In addition to aerial pesticide spraying, ground control operations will be carried out as follows:

- On a limited scale in the framework of the Three-year Programme by ground control teams set up under the aegis of FAO either from the aerial bases or independently of them to: complete aerial treatments as close as possible to the buffer zones (so-called “cleaning-up” treatments); to treat any sensitive areas using biopesticides; and each time that the limited size of the infestation and its accessibility by ground do not justify the use of aircraft; these ground treatments will be carried out using vehicle-mounted or backpack sprayers;
- Under the Government’s direct responsibility, ground control will be carried out by the Support Unit for Anti-Locust Ground Control (CALAT) in the Invasion Area and by the CNA in the Outbreak Area to protect the crops and fields directly threatened by locusts using backpack sprayers.

This close crop protection carried out by national authorities under the Ministry’s aegis is expected to have a positive social impact on rural populations by rebuilding their confidence in the actions undertaken by the Government to end the plague, thus ensuring that fields are once again cultivated having been abandoned after the passage of hopper bands or swarms, and producing an immediate impact on the livelihoods of households whose crops will be protected. It should be noted, nevertheless, that operations such as these, with a

geographically limited scope because of the nature of the treatment platform (one or several agents moving by foot), can have only a minimal impact on the dynamics of locust populations. In October 2014, agents from the Regional Agricultural Development Directorates who would participate in the operations carried out by CALAT received training on ground control techniques and all precautions to be taken in order to protect human health and preserve the environment from an FAO expert.

As was the case for the two previous campaigns, before, during and after control operations, special attention will be given to preserving human health and protecting the environment, whose biodiversity is exceptional, in accordance with the Human Health and Environment Management Plan and using information documents widely distributed to rural populations.

National capacities will be duly strengthened throughout the course of the third campaign, as was the case during previous campaigns, thanks to the mobilization of locust management expertise and the delivery of training sessions and refreshing courses, including in the field (see Annexes 4 and 5). This is essential so that the Government is able to take over locust management after the completion of the Three-year Programme, i.e. from the start of the 2016/17 campaign in the framework of the preventive control strategy.

Finally, supervision as well as technical and operational coordination of all operations, which are crucial for the success of the third campaign as they were for that of the first and second campaigns, will be provided.

3.3. Description of expected outcomes, indicators and activities by component

Following the first 2013/14 Campaign, which was decisive in stemming the plague, and the second campaign (2014/15), which supported the plague's decline and the reduction of its geographical scope and the importance and nature of Malagasy Migratory Locust populations, the third campaign in 2015/16 must ensure the return to a locust recession situation and the continued strengthening of national capacities, as defined in the Three-year Programme.

The following paragraphs describe in detail the expected outcomes for each component, the activities to be carried out during the campaign and the indicators. The logical framework, including the provisional workplan of the Programme's third campaign, is provided in Annex 6.

<u>Component 1</u>: Strengthening national capacities to monitor and analyse locust situations

Expected outcome:

The capacities for monitoring and analysing the locust situation are strengthened, thus making it possible to understand the dynamics of locust populations, implement the locust control strategy, make necessary tactical adjustments during the campaign and identify the targets for large-scale control operations.

Indicators:

- 320 survey flying hours used from October 2015 to June 2016 to survey approximately 23 million hectares in infested or likely to be infested areas.
- Spatial-temporal dynamics of grouped and scattered locust populations known and documented (in both quantitative and qualitative terms); the appearance, density, developmental stage and phase status of hopper and adult populations and the number and size of grouped populations (hopper patches and light flights) identified in the

surveyed areas, and the movements of adult groups (light flights and possibly swarms) described and mapped, etc.

- Ten-day and, as far as practical, monthly bulletins on the locust and anti-locust situation issued by the Locust Watch Unit (with the support and technical validation of FAO) no later than 15 and 30 days respectively after the reporting period.
- Number of technicians (members of the Locust Watch Unit, scouts and heads of locust posts) whose knowledge in data collection, analysis and information management is completed and strengthened.

Activities:

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

The Locust Watch Unit, established in February 2013 for the duration of the Three-year Programme and temporarily set up in the premises of the FAO Representation to Madagascar, will continue to collect all locust, ecological and weather data as well as information on damage to crops and pastures and to integrate these into a database and use it. The Unit will be strengthened through: (a) technical support for locust matters for data management and analysis; (b) continued support provided by a junior international agronomist consultant for the entire duration of the campaign in order to make more efficient the preparation and issuance of the ten-day and monthly bulletins and associated updates; and (c) support in Geographical Information System (GIS) provided by an international expert, including on-the-job refreshing course for the national GIS expert at the start of the 2015/16 campaign.

In the field, taking into consideration the lessons learned from Campaign 1 and as was already the case for Campaign 2, a junior locust expert with excellent theoretical knowledge, trained in new technologies and with good writing skills, will support scouts and Base Managers (who have experience in the field but are not always trained to provide appropriate reports i.e. precise, concise and in real time) with the following objective: to ensure that all operations are carried out correctly, that any incident is reported immediately and that all information on the locust situation and treatment is transmitted on a daily basis.

Furthermore, in order to prepare the transition towards the implementation of the preventive control strategy, plans have been made to accompany the Heads of the 28 CNA Locusts Posts in their daily work; they will receive practical training in real conditions for approximately one week. The training will be given by the national locust expert, the junior locust expert and the Head of the CNA's Technical Department.

With regard to the Programme's implementation, technical assistance on locust matters will be provided throughout the campaign as follows: a) directly by both the national locust expert and the junior international locust experts, b) remotely by an international locust consultant, and c) remotely and during her missions by the Coordinator of the FAO Response to the locust plague in Madagascar. This technical assistance will include assessing the locust situation, establishing accurate appraisals of locust population dynamics (including at the end of the campaign) and assumptions about their future likely or predictable developments as well as relevant suggestions and recommendations for tactical adjustments to the anti-locust strategy.

Activity 1.2 Support to survey operations

The information gathered from monitoring and analysing locust situations is essential – it is the cornerstone of any rational management of locust related issue and makes it possible to guide

control operations. Aerial and ground surveys must be carried out continuously throughout the anti-locust campaign from September 2015 to June 2016. In September/October 2015, ground surveys followed by extensive aerial surveys will enable to assess the importance of adult populations from the last locust breeding generation of the 2014/15 rainy season that have survived the winter period, and to identify their geographical distribution; subsequent intensive surveys will enable targets for control operations to be localized. The analysis of survey findings and other information collected on a regular basis (weather and locust reports) will provide a synoptic vision of the locust situation and enable locust population hotspots to be determined and locust diagnostics and forecasts to be established (and to prepare ten-day and monthly bulletins on locust and anti-locust situations) as well as to implement the strategy and periodically adjust anti-locust tactics, notably by prioritizing areas for treatment.

During the 2015/16 campaign, it is expected that a total of approximately 320 survey flying hours will be used (by helicopter). In addition to survey flying hours, this component will cover the acquisition of additional survey and camping equipment, all-terrain motorbikes and spare parts for vehicles as well as the operating costs for the aerial bases and survey teams.

Component 2: Strengthening national locust control capacities

Expected outcome:

National locust control capacities are improved and the numbers of Malagasy Migratory Locust populations are reduced during the 2015/16 campaign in all infested areas, thereby limiting damage to crops and pastures because of the locust plague.

Indicators:

- Between 300 000 and 400 000 hectares treated between September 2015 and June 2016.
- Locust mortality rate in the treated areas over 85 percent.
- Number of infested locust regions reduced (reference: map dated 30 June 2015).
- Number of staff trained/retrained in campaign management and aerial and ground spraying techniques.
- Relative importance of damage to crops and pastures.

Activities:

Activity 2.1 Strengthening human capacity for locust control

Technical assistance for locust control will be provided for the duration of the campaign. Training and refreshing courses in aerial and ground Ultra-Low Volume spraying techniques, including with biopesticides, will be delivered mostly on-the-spot by international experts to CNA heads of ground control assigned to the seven locust control areas and to control staff at the aerial and field bases working for the CNA, the Plant Protection Directorate and the Regional Agricultural Development Directorates, as well as to staff from CALAT, established in April 2014 as part of the Ministry of Agriculture.

As mentioned in Paragraph 1.1, a junior locust expert will also provide support for scouts and Base Managers to ensure that all operations are undertaken correctly, that any incident is immediately reported and that all information on the locust situation and treatment is transmitted on a daily basis.

Activity 2.2 Support for locust control operations

The quantities of pesticides needed to treat a maximum of 400 000 hectares will be supplied (through the triangulation process and purchase). Given the number of hectares to be treated or protected and the extent of the area concerned, one aerial base, equipped with one helicopter, will be set up from October 2015 to June 2016. Support from the Three-year Programme includes approximately 480 flying hours for control operations as well as the operating costs of the aerial base. It will also cover the procurement of additional equipment including personal protective equipment, camping and control equipment and spare parts for 4x4 vehicles and trucks.

The quantities of pesticides needed (in litres or kilograms) and the areas to be treated or protected (in hectares) during the third campaign are listed in **Table 2**. As mentioned above, control operations will be carried out using three types of pesticides: rapid-action conventional pesticides (full-cover treatments), IGRs for hoppers (barrier treatments) and biopesticides near ecologically-sensitive areas.

Table 2: Quantities of pesticides required for the 2015/16 campaign and hectares to be treated or protected

PESTICIDES and type of treatment	Quantities	Hectares to be treated/protected
Conventional (litres): full cover	100 000	100 000
Insect growth regulators (litres): barrier	50 000	250 000
Biopesticide (kg)[10]: full cover or barrier	1 000	20 000
TOTAL		**370 000**

<u>Component 3</u>: Preserving human health and protecting the environment

Expected outcome:

No incidents affecting human health during aerial control operations or the handling of pesticides are reported; the impact of control operations on the environment is limited.

Indicators:

- Number of reported incidents affecting human health during aerial anti-locust operations or the handling of pesticides.
- Number and severity of any potential incident affecting the environment.
- Number of staff trained or retrained to monitor the impact of treatments on human health and the environment, in the use of the PSMS (PSMS) and the use of the drum-crusher.

[10] Biopesticide: the quantities required for the Three-year Programme were purchased during the 2013/14 campaign. The available stock at the end of the 2014/15 campaign amounts to just over 1 000 kg, allowing the treatment of at least 20 000 hectares (mix of dry spores and diesel using one kilo of spores for 20 litres of diesel and spraying a volume of one litre per hectare as full cover treatment, or, possibly, as barrier treatment).

Activities:

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

Technical assistance will be provided and training or refreshing courses will be delivered as follows: in November 2015, a mission will be carried out by an international environmental expert with regard to monitoring the impact of treatments on human health and the environment; in February/March 2016, training/refreshing courses will be delivered on the PSMS and the use of the drum-crusher. During the third campaign, recommendations will be made to revise environmental specifications based on observations made during recent anti-locust campaigns, particularly the Three-year Programme.

Activity 3.2 Support for mitigating and monitoring the impact of treatment on human health and the environment

The Human Health and Environment Management Plan (PGSE) that was prepared at the beginning of the Three-year Programme by two international environmental experts will continue to be scrupulously implemented during the third anti-locust campaign.

FAO and the Ministry of Agriculture will continue to pay particular attention to communication aspects and populations' awareness-raising on the precautions to be taken during control operations in the concerned areas (distributing flyers and poster-calendars, broadcasting television adverts and radio announcements, publishing articles in the press, etc.).

Furthermore, the Three-year Programme (which contributed to training two teams in monitoring the impact of treatment on human health and the environment and one team in managing empty pesticide drums) will continue to cover the operating costs of one monitoring team and one pesticide drum management team; the skills of the latter will be strengthened. In close collaboration with the Campaign Coordinator and the logistics experts, the national expert and designated focal point will ensure pesticide management throughout the 2015/16 campaign.

Activity 3.3 Construction of a pesticide storage facility

The construction of a pesticide storage facility in Toliara is now planned during the 2015/16 campaign. The tender procedure launched during the 2013/14 campaign resulted in a construction company being selected in May 2014, but the contract was not signed until the beginning of March 2015 (after the extension in February 2015 of the project funding for 90 percent of this construction). At the end of the 2014/15 campaign, after several delays and contractual breaches on the part of the construction company, work had still not begun. The contract was therefore terminated in August 2015. A new tender was launched in September 2015. The company selected after the tender process must guarantee the construction of the storage facility before the end of the Three-year Programme, i.e. by the end of June 2016. Related human resources (a national engineer supported by an international architect during occasional missions) will be covered by the Programme.

Component 4: Implementing and coordinating the Programme

Expected outcome:

The supervision and technical and operational coordination of the overall Programme as well as of field operations are conducted and adjusted if required, allowing the campaign's and the Programme's expected outcomes to be achieved in the best possible way.

Indicators:

- Supervision and coordination mechanism effective and efficient.
- Anti-locust campaign implemented as planned.
- Positive results for the entire campaign and the Three-year Programme overall.

Activities:

Activity 4.1 Strenghtening management and coordination capacities for locust emergencies

In accordance with the official request for assistance dated 5 December 2012, the implementation of activities enabling the Three-year Programme's objectives to be achieved will continue to be supervised and coordinated by FAO. Within this framework, a feedback will be needed for the National Locust Emergency Plan, drawn up in October 2012 and cleared by the Council of the Government in September 2013, based on an innovative approach to locust control. Liaison will be maintained with the Coordination of anti-locust parallel interventions (CIPA), set up in May 2015 within the Ministry of Agriculture in Antananarivo. The CIPA is a temporary structure that aims at coordinating stakeholders involved at different levels in locust control in Madagascar (CALAT, CNA and FAO), and reforming the structure and organization of the CNA with the aim of implementing a preventive control strategy.

Activity 4.2 Coordination of the Programme

The effective coordination of the Three-year Programme (2013–2016) in response to the locust plague is essential for its success. This involves: (a) the daily supervision and coordination of field operations through international technical expertise (Campaign Coordinator and logisticians); (b) the implementation of the Three-year Programme by the FAO Representation in Madagascar through the operational, administrative and financial management of the Programme, the procurement of inputs and awarding of contracts, the triangulation of pesticides, staff management, monitoring of activities and expenditures, preparation of reports at Programme level, mobilization of resources, dissemination of information and liaison with all stakeholders including the authorities and technical and financial partners in Madagascar, etc.; and (c) the supervision and technical coordination of the Programme at FAO headquarters, including defining the locust control strategy and approving related tactical adjustments, programming and planning, drawing up the technical specifications of inputs, the technical validation of offers, drafting experts' terms of reference and undertaking their technical supervision, revising and approving Programme reports, consultants' reports, ten-day and monthly bulletins, articles for the press and other strategy and/or technical documents and mobilizing resources at international level.

At the end of the third campaign and of the Programme, in addition to the technical assessments relating to Component 5 (see below), a global assessment of the implementation and management of the Three-year Programme (2013–2016) will be made by the FAO Office of Evaluation.

Activity 4.3 Support the transition towards a preventive control strategy

At the end of the campaign, a workshop will be organized to support the transition from the end of the Emergency Programme to the start of an effective and sustainable preventive control strategy. During the workshop, a preliminary overview of the results achieved over the course of the Three-year emergency Programme will be presented, lessons in carrying out such a programme will be learnt by stakeholders (which should enable national actors to improve the National Locust Emergency Plan) and the principal steps to implement an effective and sustainable locust preventive control strategy in Madagascar (with the continual political and financial support of national authorities) should be defined by the national actors themselves with FAO support.

Component 5: Assessing the effectiveness of the anti-locust campaign and the impact of the locust crisis on crops and pastures.

Expected outcome:

The findings of the assessment of the effectiveness of the anti-locust campaign and the impact of the locust crisis on crops and pastures as well as the food and nutrition security of affected populations are available for all stakeholders.

Indicators:

- Findings of the assessment of the effectiveness of the anti-locust campaign and the Programme available and disseminated.
- Findings of the impact assessment of the locust crisis on crops and pastures as well as on the food and nutrition security of affected populations available and disseminated.
- Lessons learnt by stakeholders in the implementation of a large-scale programme with the aim of implementing an effective and sustainable preventive control strategy in Madagascar with the continual political and financial support of national authorities.

Activities:

Activity 5.1 Assessing the effectiveness of the anti-locust campaign

At the end of the third anti-locust campaign, an assessment of its implementation and effectiveness will be made. The assessment will also be used as a technical overview for the entire Three-year Programme, putting each of the three campaigns into perspective and assessing the achievement of the Programme's results in locust control. Lessons will be learnt to implement any large-scale locust control programme in Madagascar (or elsewhere), which will contribute to provide a feedback for the National Locust Emergency Plan (see Paragraph 4.1.). Recommendations will also be made to define and implement a preventive control strategy at the end of the Three-year Programme.

Activity 5.2 Assessing the impact of the locust crisis on crops and pastures

An Assessment of the impact of the locust crisis on crops and pastures as well as on the food and nutrition security of affected populations will be conducted and a summary will be made available at the end of the campaign. If necessary, the figures obtained will serve as a basis to determine requirements and identify the support to be provided to farming households whose livelihoods have been affected by the locust crisis.

3.4. Assumptions and risks

The success of the implementation of this Programme is based on the following assumptions:

- Government's participation and support for the anti-locust campaign.
- No major deterioration of the socio-political context or of the security situation.
- Availability and timely provision of required funds.
- Availability of national and international human resources.
- Availability of the required equipment.
- Absence of extreme weather events.

4. IMPLEMENTATION ARRANGEMENTS

4.1. Management modalities and partnerships

FAO will be directly responsible for implementing the Programme and its third campaign in close collaboration with the Ministry of Agriculture, particularly with the main national stakeholders involved in the Programme implementation, i.e. CIPA, the Plant Protection Directorate and the Regional Agricultural Development Directorates as well as the CNA.

The effective implementation of activities enabling the Three-year Programme's objectives to be achieved will be supervised and coordinated by FAO experts (at headquarters and FAO Representation in Madagascar), and in the field by the international Consultant, Campaign Coordinator, with the support of his deputy and a Logistician. Activities will be conducted with support from the CNA staff in the Malagasy Migratory Locust Outbreak Area and from the Plant Protection Directorate, the Regional Agricultural Development Directorates and CALAT in the Invasion Area.

The Programme team will work actively with all stakeholders and agencies to avoid the duplication of efforts. Local and national administrations and organizations will be involved in Programme's implementation, especially regarding the timely flow of information.

Finally, a partnership will also be established if needed with other organizations involved in locust control, in particular the National Environment Agency.

4.2. Technical and operational support for the Programme's implementation

Over the course of the 2015/16 campaign, FAO will continue to mobilize the human resources required to ensure the success of the Three-year Programme (2013–2016) in response to the locust plague. In addition to field experts, technical and operational support for the Programme will be provided through the professional expertise outlined below.

At the FAO Representation in Madagascar: the FAO Representative , the Deputy Representative and the Operations Coordinator will ensure close liaison with all the stakeholders involved in managing the locust plague (e.g. ministries, technical and financial partners operating in Madagascar, experts in the field, etc.) with support from the Operations Officers. Operations Officers, under the direct supervision of the Operations Coordinator, will manage the Programme's operational and financial aspects, including monitoring the input procurement process, (from tender to delivery in Madagascar) and pesticide triangulation, establishing contracts, recruiting and managing staff, monitoring activities and expenditure and monitoring operations in close collaboration with FAO headquarters and consultants in the field (pre-positioning of all inputs, supporting international technical experts, etc.). National experts will provide support for the operational, administrative, logistics and financial management aspects of field operations.

At the FAO headquarters in Rome:

- The Locusts and Transboundary Plant Pests and Diseases team (Coordinator of the FAO response to the locust plague in Madagascar, Senior Locust Expert, and Locust Programme Officers) will ensure the Programme's supervision and technical coordination as well as technical monitoring, both remotely and during field missions. This will include: the definition of the locust strategy and any necessary adjustments; the coordination and consistent implementation of all projects contributing to the

Programme; the definition of the required technical profiles, the preparation of relevant terms of reference and the identification of technical staff; the technical supervision of consultants; the preparation of technical specifications for inputs; the approval and monitoring of the technical and operational execution of letters of agreement; technical evaluation and clearance of tender results; the monitoring of the pesticide triangulation process (with transport provided by FAO and funded from the campaign's budget); daily supervision of the technical choices made and the implementation of operations in close collaboration with the Campaign Coordinator and other technical experts; monitoring and approval of technical documents (including ten-day and monthly bulletins); the clearance of both mission reports and activity reports; and liaison with technical and financial partners on all technical aspects.

- The Procurement Service will launch international tenders for the procurement of equipment and services (contracts) in accordance with FAO rules and regulations, based on detailed technical specifications prepared by the technical team.

The above-mentioned staff in Madagascar and at FAO headquarters will continue to play an active role in determining the financial resources required for the implementation of the 2015/16 campaign.

4.3. Donors' inputs

The human and material resources required for the 2015/16 campaign are summarized below:

Field experts: this category includes human resources to implement the 2015/16 campaign as described in Paragraph 4.2 (national and international technical and operational support staff working in the field): Campaign Coordinator; logisticians; locust experts; experts in GIS; experts in data management (Locust Watch Unit); agronomist, environmental experts; pesticide and empty drum management experts, experts in the elimination of empty drums; national engineer and international architect for the construction of the pesticide storage facility and evaluation experts to assess the campaign and the impact of the locust crisis on crops and pastures.

Training: training sessions/refreshing courses and, above all, on-the-spot training will be organized in the following technical fields: collection, analysis and management of data on locust, weather and related topics; GIS; ground and aerial control; aspects related to mitigation measures and monitoring the impact of control operations on human health and the environment (including during the storage, transport and handling of pesticides, etc.); PSMS; use of drum-crushers; etc.

Contracts: a contract will be signed between FAO and an aircraft company specialized in agricultural work for the provision of one helicopter and an estimated 800 flying hours during the 2015/16 campaign, including 320 hours for survey operations and 480 hours for locust control operations. This contract will also cover the cost of logistics and helicopter mobilization/demobilization. In addition, a contract will be signed and carried out for the construction of a pesticide storage facility in Toliara.

Equipment: The following expendable and non-expendable equipment will be made available:

- *Pesticides*: triangulation of 100 000 litres of a conventional pesticide (active ingredient: Chlorpyrifos-ethyl) and procurement of 50 000 litres of IGR (active ingredient: Teflubenzuron). These pesticides will be stored in the central and secondary pesticide storage facilities of the CNA and the Regional Agricultural Development Directorates

and transported to aerial and ground bases by road and track in 4x4 trucks[11]. Safe storage of pesticide drums will be guaranteed at each base as well as the collection and gathering of empty drums in accordance with best practices.

- *Vehicles*: the necessary vehicles have already been purchased during the first campaign. A total of 28 4x4 vehicles are available for the missions of staff assigned to aerial and ground bases (e.g. locust scouts and control agents) and teams monitoring treatments and managing pesticides, etc.; 18 motorcycles were purchased during the first and second campaigns. Ten additional motorcycles will be purchased during the 2015/16 campaign to total 28 motorcycles distributed to the locust posts. Four trucks (also purchased during the first campaign) will transport the pesticides from the storage facilities to the aerial and ground bases or treatment areas and bring empty drums back to the storage facilities. Vehicles with drivers will be made available to the various teams involved in implementing the campaign (coordination, preservation of human health and protection of the environment, pesticide management and campaign assessment) depending on requirements. All vehicles are scrupulously monitored with a vehicle logbook (indicating every trip, its purpose, the staff on board and relevant mileage), updated regularly (including updated maintenance logs) and equipped with a radio transmitter-receiver, survival kit and first aid kit. Additional spare parts for 4x4 vehicles and trucks will be purchased for the 2015/16 campaign.
- *Positioning and communication equipment:* 100 Global Positioning Systems, as well as 11 fixed and 35 mobile single-sideband modulation radios (for vehicles) and seven satellite phones are still available from the 2013/14 campaign.
- *Personal protective equipment:* this is essential for all staff involved in control operations and pesticide or empty pesticide drum handling. This equipment must be available in sufficient quantities (two kits per agent and per campaign). Some items (overalls) will be purchased again during the 2015/16 campaign to replace the normal wear and tear of the equipment procured and used during the previous campaign.
- *Camping equipment:* good quality camping equipment is essential for the mobile bases because the staff has to live there for several months. Some camping equipment items will be repurchased depending on the wear and tear of the equipment procured and used during the 2013/14 and 2014/15 campaigns.
- *Sprayers*: two AU8115 vehicle-mounted sprayers, 90 AU8000 backpack sprayers, and 150 ULVA+ hand-held sprayers are still available from the 2013/14 campaign for ground treatment.
- *Health and environmental monitoring equipment:* this equipment procured during the first and second campaigns includes cholinesterase kits to measure the level of exposure to conventional pesticides (Chlorpyrifos) in operators' blood as well as antidotes and equipment for environmental monitoring.
- *IT equipment*: human and material resources management software as well as IT equipment, particularly for the field bases, are still available from the 2013/14 campaign.
- *Survey equipment:* the equipment procured during the 2014/15 campaign will be

[11] The Programme has no other option but to make use of the existing main and secondary warehouses (the first located in Toliara) even though they do not meet international standards because, due to the prevailing locust plague situation, it is necessary not only to carry out operations throughout the entire territory but also to pre-position pesticides in areas that are cut off during the rainy season.

completed or renewed depending on requirements. This includes: sweep nets to capture locusts; callipers, scissors, tweezers and magnifying glasses to observe them; and tachometers and hydro-thermometers, etc. for weather observation.

- *Other equipment:* pumps, hoses and mixers for pesticides will be procured.

General operating expenses: operating expenses related to the implementation of various campaign activities and running the aerial and ground bases include the purchase of fuel and lubricants, vehicle maintenance, and eventual repair (or if necessary, car rental), the operational costs of the various teams, the purchase of small office supplies, communication costs including printing or copying material for communications/visibility, awareness and training activities, insurance costs, etc. This budget line also includes the rental of a cold room for biopesticides and the security costs for the field bases.

4.4. Government's inputs

The Government will make all the necessary arrangements to facilitate the Programme's implementation and assist its personnel and those of FAO to obtain the necessary clearances. It will ensure exemption from all taxes on imports of essential supplies and equipment for the regular execution of the Programme, obtain overflight permits for aircraft contracted by FAO, and facilitate the administrative procedures for Programme implementation.

The Government will ensure the full-time participation of national managerial and technical staff needed for the smooth implementation of the Three-year Programme throughout its duration and will designate national staff required for the smooth execution of activities. The staff will cooperate with FAO to implement the Programme, including for survey, control, pesticide management and environmental monitoring operations.

The Government will continue to make its premises available to the Programme to serve as offices for the Programme team in Antananarivo, Toliara and Betioky and in any other location on the Malagasy territory. In addition, it will continue to make available to FAO the warehouses of the Regional Agricultural Development Directorates for the temporary storage of pesticide drums procured for the Three-year Programme.

In line with the Programme's activities (prevalence of aerial treatments completed by ground control operations using vehicle-mounted sprayers and biopesticide spraying), the Government is responsible for organizing ground control operations carried out by the CNA in the Outbreak Area and by the Support Unit for CALAT in the Invasion Area. As of May 2015, CIPA has been set up to coordinate the activities of the institutions involved in different levels in the fight against the locust plague in Madagascar.

The continuous exchange of information will make it possible to coordinate these different activities and to ensure the best possible synergy between the impact on the locust plague and the protection of small farmers.

5. MONITORING, ASSESSMENT AND INFORMATION

5.1. Monitoring

FAO will be responsible for the continuous monitoring of the activities of the Three-year Programme (2013–2016) in response to the locust plague, with support provided by Government staff. A simple internal monitoring system based on performance indicators will be used for this purpose. Using this system, FAO staff will examine the progress of the Three-year Programme implementation, highlight potential problems and recommend appropriate solutions.

In addition to the indicators related to the various activities of the five components (see Section 3), the monitoring indicators of the Programme are defined as follows:

- Number of reports on damage to crops or pastures and number of hectares affected (i.e. the negative impact of the plague on food security).
- Quantitative and qualitative development of locust populations throughout the campaign.
- Number and phase status of eventual grouped locust populations still present at the end of the campaign (locust recession situation).
- Number and nature of reported human health incidents concerning the control staff, personnel involved in pesticide management and local populations.
- Number and nature of reported incidents concerning adverse impacts of control operations on non-target wildlife and the environment.
- Reports on impact monitoring of control operations on human health and the environment carried out in the framework of the Three-year Programme.
- Mapping of the location of all empty pesticide drums at the end of the campaign (collection completed and gathering underway or completed)
- Number of national technical staff trained in the different themes identified.

5.2. Assessment

Under Component 5 of the Programme, two assessments will be conducted at the end of the 2015/16 campaign, as was the case at the end of the two previous campaigns. The first assessment will cover the impact of the locust crisis on crops and pastures (damage caused) and, consequently, on the food security and living conditions of affected populations. This assessment will make it possible to provide support for affected populations in collaboration with humanitarian partners, if required. The second assessment will focus on the third anti-locust campaign, including the quality, effectiveness and impact of control operations on human health and the environment, and, in addition, on the technical implementation of the Three-year Programme. The assessment will be useful for all partners involved, and particularly for national actors. It will provide a feedback for the National Locust Emergency Plan. It will further highlight efforts to be made at every level from the multi-year programme planning to its effective field execution, subject to the availability of all necessary funds, to bring to an end a locust plague that can affect almost half of the Malagasy territory. It will also demonstrate how crucial it is to implement a preventive locust control strategy to guard against major locusts crises, which are complex and extremely costly to manage.

At the end of the third campaign, in addition to these technical assessments, a global assessment of the implementation and management of the Three-year Programme will be

conducted by the FAO Office of Evaluation, which will also take into account the Programme's managerial and operational management. The findings will be shared with all stakeholders including technical and financial partners and will contribute to improving FAO's capacities to plan and implement emergency anti-locust campaigns in the future, if required.

5.3. Reports

The Three-year Programme (2013–2016) in response to the locust plague will produce the following documents/reports:

- Ten-day and, as far as practical, monthly bulletins on locust and anti-locust situations, which will be widely distributed throughout the campaign.
- Consultants' mission reports (available upon request).
- Interim and end-of-campaign (final) reports prepared by FAO in accordance with its procedures. These reports will review the activities carried out and will present the major results achieved, problems encountered, progress made in reaching the Programme's objectives and the impact on beneficiaries. A chapter will be included on recommendations and lessons learnt, presenting the main guidelines for potential future interventions.
- End-of-Programme workshop report (including a preliminary overview of the results achieved, lessons learnt and the main steps to implement a preventive control strategy in Madagascar).
- At the end of the third campaign, the following assessment reports will be available: assessment report on the effectiveness of the anti-locust campaign and of all the three anti-locust campaigns implemented during the Programme, an assessment report on the impact of the locust plague on food security, crops and pastures, and a global assessment report on the Programme's implementation and management.

In addition to these reports, financial and narrative reports will be provided to each donor concerning their specific contributions if this has been planned in the agreements made with each of them and in accordance with the modalities described in these agreements.

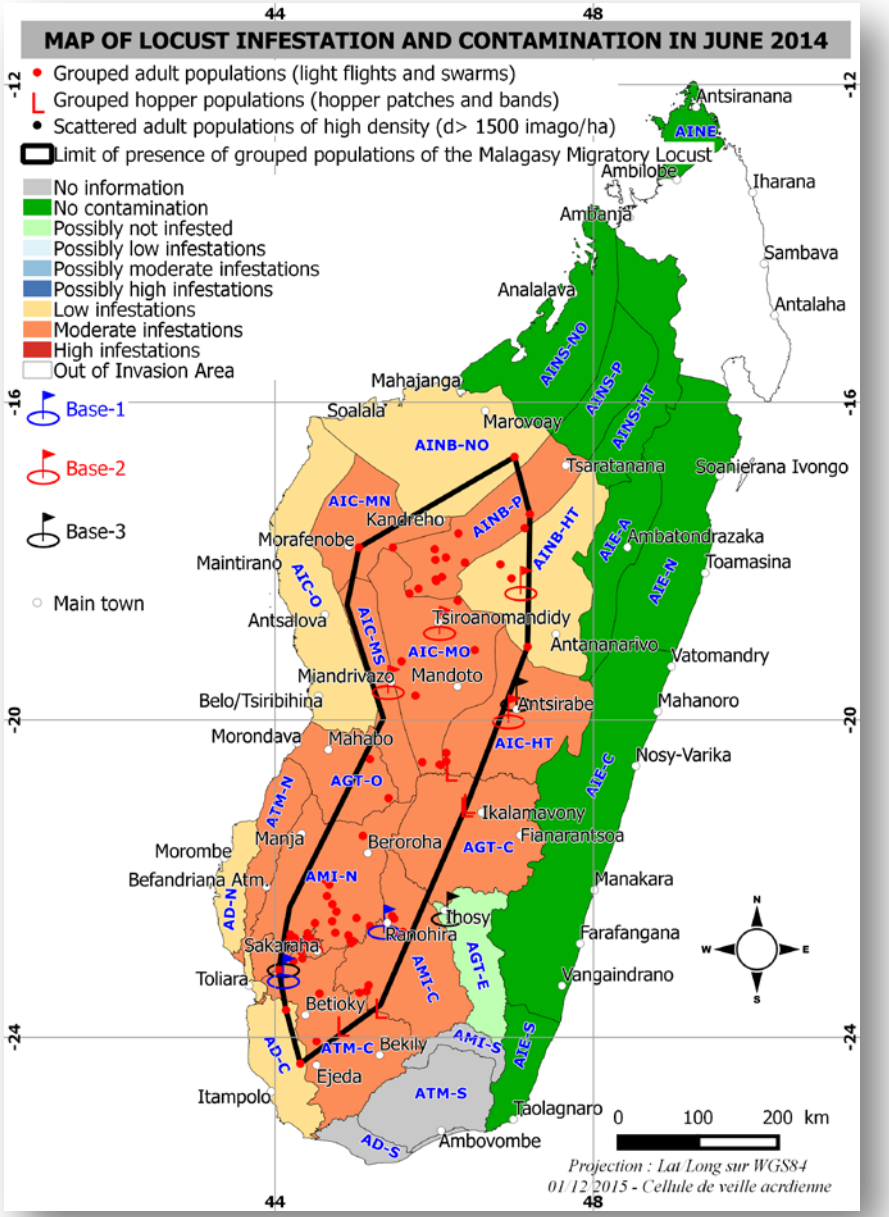
5.4. Communication and visibility

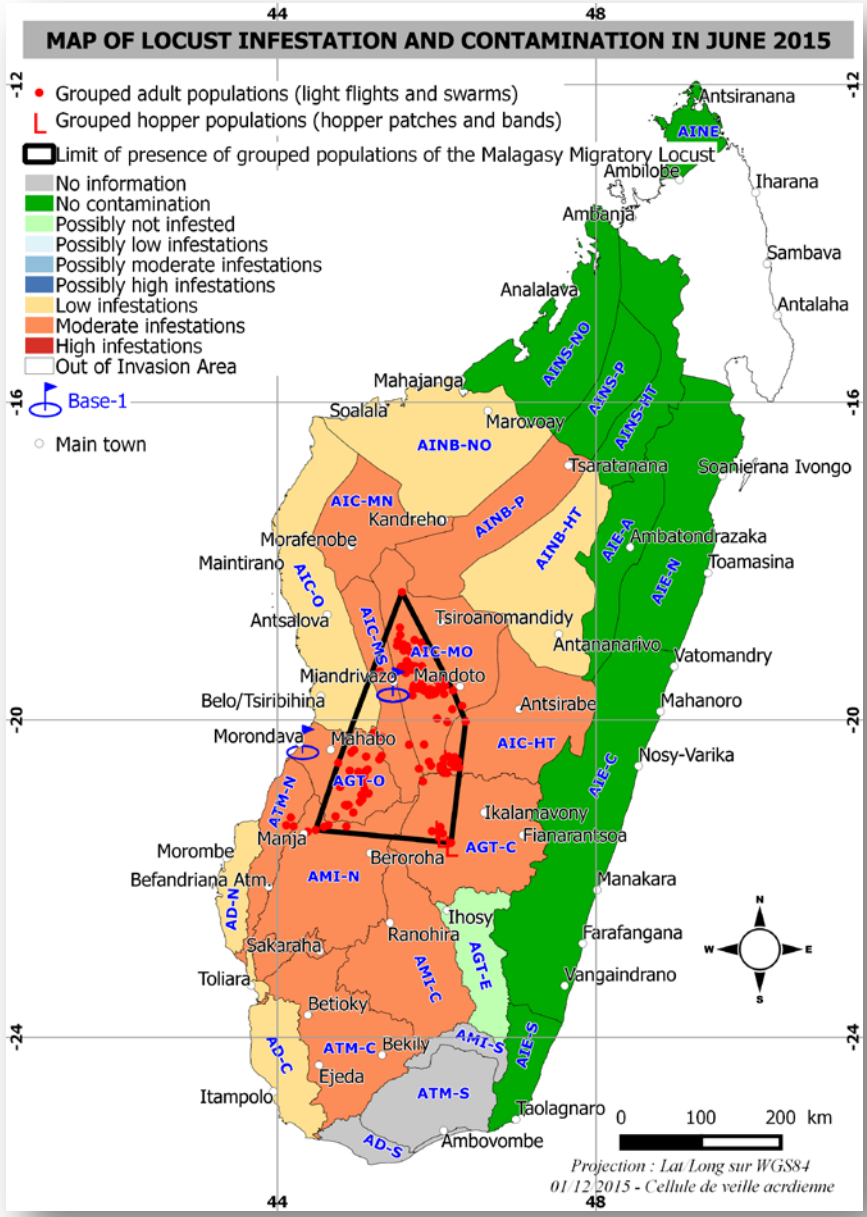
FAO will ensure that all technical and financial partners are regularly informed about the campaign's implementation through periodic bulletins and situation updates regularly disseminated (as previously mentioned) and information meetings at key periods of the campaign.

More broadly, FAO will provide maximum visibility for Programme activities through national and international media, its own web site and internal publications. Particular attention will be paid to communications and visibility through press releases at key periods of the Programme's implementation and publishing a bimonthly journal of the campaign, a ten-day information bulletin as well as a monthly update on the locust situation and control operations. FAO will also give strong visibility to all donors funding the Programme.

ANNEXES

Annex 1: Maps of locust situations in June 2014 and June 2015





Annex 2: Areas treated, flying hours carried out and pesticides used during Campaign 2 (2014/15) as of 15 August 2015

Table 1: Total treated and protected areas by aerial and ground control operations as of 15/08/2015

Area (ha)	Aerial treatment	Ground treatment	Total
Treated	**165 860**	**11 255**	**177 115**
Protected	**461 750**	**1 170**	**462 920**
Total	**627 610**	**12 425**	**640 035**

Table 2: Total flying hours carried out as of 15/08/2015

	Conveyance	Survey	Set-up	Spraying	Miscellaneous	Total
F-GEDF	101h57	347h55	136h23	122h07	29h58	738h20
Percentage	13.81%	47.12%	18.47%	16.54%	4.06%	
F-GFCS	78h54	401h10	137h49	149h22	33h55	801h10
Percentage	9.85%	50.07%	17.20%	18.64%	4.23%	
TOTAL	180h51	749h05	274h12	271h29	63h53	1 539h30
Percentage	11.75%	48.66%	17.81%	17.63%	4.15%	**100.00%**

Table 3: Quantities of pesticides used as of 15/08/2015

Pesticides and biopesticide	Total
Conventional pesticide (litre)	**171 798**
Insect Growth Regulator (litre)	**87 180**
Biopesticide (kg)	**366**

Annex 3: Administrative map of Madagascar



Annex 4: Planned expertise during Campaign 3 (2015/16)

Component	Types of expertise planned in the Campaign 3 Programme document	Job title and field of expertise	Mission dates		Duration (months)
			Start	End	
1	Locust studies	International junior locust experts [12]	15/10/2015	25/02/2016	4
			20/02/2016	30/06/2016	4
		National locust expert, Deputy Coordinator of 2015/16 Campaign	01/09/2015	30/06/2016	10
		International locust expert	Throughout the campaign (remotely) and in June 2016		1
1	Data management and analysis on locusts, weather situation and damage to crops and pastures (Locust Watch Unit)	Junior Agronomist consultant to support the Locust Watch Unit	1/09/2015	30/06/2016	10
		Locust Watch Unit/data on locusts and damage to crops and pasture	1/09/2015	30/06/2016	10
		Locust Watch Unit/meteorological and anti-locust data	1/09/2015	30/06/2016	10
		National GIS expert	1/09/2015	30/06/2016	10
1	Geographical Information System (GIS) (Locust Watch Unit)	International GIS expert	01/10/2015	31/10/2015	1
3	Monitoring the implementation of the Human Health and Environment Management Plan (PGSE)	International environmental expert	01/11/2015	30/11/2015	1
3	Pesticide and empty container management	International expert in Pesticide Stock Management System	February/March 2016		0.75
3	Elimination of empty containers	International expert – drum-crusher installation/training	February/March 2016		0.75
3	Construction of the pesticide storage facility	Architect	To be decided	To be decided	1
		Engineer	01/09/2015	30/06/2016	10
4	Campaign coordination	Campaign coordinator	25/10/2015 10/02/2016 15/05/2016	20/12/2015 10/04/2016 30/06/2016	6
4	Aircraft logistics	Aircraft logistician	20/10/2015 25/02/2016	20/11/2015 25/04/2016	3
		Expert in spraying techniques	10/11/2015	29/02/2016	6

[12] The need for a permanent presence of at least one FAO expert on each aerial base became evident during Campaign 1 to ensure that all operations are conducted properly, that all incidents are immediately reported and that all information on the locust situation and control operations is transmitted on a daily basis. The number of FAO experts with all the required knowledge, skills and experience is limited and they are often already involved in the anti-locust campaign in Madagascar at other key positions or elsewhere. Moreover, it is costly to hire these experts and therefore it is not possible to assign a "senior" expert to each base. Because the tasks at each base essentially involve daily monitoring and support, the best solution was to assign a "junior" expert. These experts, who master new technologies and have excellent theoretical and technical knowledge and good writing skills, are ideal to support scouts and aerial base managers who have the required field experience but are not always able to report in an appropriate way (accurate, concise and almost in real time). The functioning of the aerial bases was greatly improved thanks to the presence of these experts, from February 2014 onwards, and it was decided to extend the positive experience of their presence.

Component	Types of expertise planned in the Campaign 3 Programme document	Job title and field of expertise	Mission dates		Duration (months)
			Start	End	
			20/04/2016	30/06/2016	
4	General logistics	International logistics expert	1/09/2015	30/06/2015	10
4	Global assessment of the implementation and management of the Three-year	Final assessment of the Three-year Programme: team of consultants with different profiles (FAO Office of Evaluation)	May/June 2016		1
5	Technical assessment of the effectiveness of the anti-locust campaign	Evaluation of Campaign 3: Locust expert and Campaign Manager	June 2016		1
5	Technical assessment of the impact of the locust plague on crops and pastures	Evaluation of the impact of the locust plague on crops and pastures: agricultural economist (CFSAM)	June/July 2016		1

Annex 5: Planned training during Campaign 3 (2015/16)

Component	Nature of training	Beneficiaries	Period	Trainer/Technical assistance
1	Data collection, analysis and information management	Members of the Locust Watch Unit	On-the-spot for the duration of Campaign 3	Locust experts
		Aerial base scouts	On-the-spot for the duration of Campaign 3	Locust experts
		28 Base Managers from the CNA	November and December 2015, January and February 2016	National locust expert Junior locust expert and CNA Head of Technical Department
	Geographical Information System	Members of the Locust Watch Unit	October 2015	International GIS expert
2	Campaign management	Locust control staff assigned to the airbase, in particular the base manager and his deputy, seconded from the National Anti-Locust Centre and the Plant Protection Directorate	On-the-spot for the duration of Campaign 3	Campaign coordinator
2	Aerial and ground spraying techniques in ultra-low volumes (with backpack sprayer for full cover and barrier treatments) including biopesticides	Locust ground control staff of the CNA assigned to the seven anti-locust areas and locust control staff assigned to the aerial base seconded from the CNA, the Plant Protection Directorate and the Regional Agricultural Development Directorates or CALAT	On-the-spot for the duration of Campaign 3	Spraying techniques expert/Campaign coordinator
3	Monitoring of the impact of treatments on human health and the environment	Members of the human health and environment monitoring team	November 2015	International environment expert
	Pesticide Stock Management System	Refreshing courses for members of Pesticide Stock Management System team	February/March 2016	International PSMS expert
	Use of drum-crusher	Members of the Pesticide Stock Management System team + National Anti-Locust Centre team responsible for drum crusher	February/March 2016	International expert – installation/training drum crusher

Annex 6: Logical framework and workplan of the Programme in response to the locust plague in Madagascar – Campaign 3 (2015/16)

Intervention logic	Objectively verifiable indicators	Sources and means of verification	Assumptions
Overall objective Contribute to safeguarding the food security of the most vulnerable populations in Madagascar.	- The relative significance of the impact of the locust plague on agricultural production and on the livelihoods of rural populations in Madagascar. - Vulnerable populations' in Madagascar improved availability and access to staple food (rice, maize). - Reduced or stabilized market prices of staple food (rice and maize). - Reduced levels of malnutrition.	- CFSAM report. - Section 3 "Agro-socio-economic situation" of the ten-day and monthly bulletins from the Locust Watch Unit. - Assessment report on the impact of the plague on crops and pastures. - Reports of the *Observatoire du riz* (Rice Observatory platform) of the *Plan d'Action pour le Développement Rural* (Action Plan for Rural Development). - Interim and final reports of the Programme. - FAOSTAT. - Reports by UNICEF and other agencies.	- No major deterioration in the socio-political context. - Government participation in and support for the anti-locust campaign. - Timely availability of the required funds. - Availability of national and international human resources depending on the identified profiles. - Availability of required equipment. - No extreme weather events with a direct impact on agricultural production.
Specific objective Returning to a locust recession situation and strengthening national capacities in anti-locust management.	- Relative significance of damage to crops and pastures because of locusts. - Reduction of the geographical extension and surface of infested areas. - Number and phase states of grouped locust populations still present at the end of the campaign.	- Ten-day and, as far as practical, monthly reports by the Locust Watch Unit. - Consultants' reports. - Assessment reports of the 2015/16 campaign. - Interim and final reports of the Programme.	

Component 1. Strengthening national capacities to monitor and analyse locust situations														
Expected outcome: The capacities to monitor and analyse the locust situation are strengthened, thus making it possible to understand the dynamics of the locust populations, implement the locust control strategy, make necessary tactical adjustments during the campaign and identify the targets for large-scale control operations.	- 320 flying hours of aerial surveys to be undertaken from October 2015 to June 2016 to survey around 23 million hectares in the areas infested or likely to be infested - Spatial-temporal dynamics of locust populations are known and documented (in both quantitative and qualitative terms); the number, size, density, developmental stage and phase status of hopper and adult populations and the number and size of grouped populations (hopper bands and light flights) are described in the infested areas and the movements of grouped adult populations are described and mapped etc. - Ten-day and, as far as practical, monthly bulletins on the locust and anti-locust situation are published by the Locust Watch Unit (with the support and technical validation of FAO) no later than 15 and 30 days respectively, after the reported period. - The number of technicians (scouts and members of the Locust Watch Unit, scouts and Base Managers) whose capacities in data collection, analysis and information management are completed and strengthened.	- Maps of locust populations hotspots available on a regular basis. - Ten-day and, as far as practical, monthly bulletins from the Locust Watch Unit. - Daily helicopter flight logbooks. - Outlines of survey routes. - Consultants' reports. - Assessment report for the 2015/16 campaign. - Interim and final reports for the Programme.												
Activities of Component 1	**Sub-activities of Component 1**		**Workplan of activities**											
			S	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**
Activity 1.1. Strengthening human capacities in data collection and analysis, and information management	1.1.1. Making available national and international technical assistance in locust expertise and GIS for the collection, analysis and management of information throughout the campaign, including tactical adjustments of the locust control strategy.		x	x	x	x	x	x	x	x	x	x			
	1.1.2. Organizing training/refreshing courses in data collection, information analysis and management for the two members of the Locust Watch Unit and the national GIS expert, the two aerial base scouts and 28 Head of locust outposts.			x	x	x	x	x	x						
Activity 1.2. Support for survey operations	1.2.1. Procurement and pre-positioning of the necessary equipment for survey operations from October 2015 (survey equipment, camping equipment and spare parts for 4x4 vehicles and motorcycles).		x	x	x	x									
	1.2.2. Establishment of operational and secure aerial base (by awarding contracts to an airline company and mobilizing a helicopter and personnel).			x	x	x	x	x	x	x	x	x			
	1.2.3. Executing the aerial survey plan in infested areas from the secure mobile aerial base: 320 flight hours used from October 2015 to June 2016 to survey approximately 23 million hectares.			x	x	x	x	x	x	x	x	x			

Component 2. Strengthening national locust control capacities			
Expected outcome: National locust control capacities are improved and the number of Migratory Locust populations is reduced during the 2015/16 campaign in all infested areas, thereby limiting damage to crops and pastures due to the locust plague.	- 300 000 to 400 000 hectares treated between September 2015 and June 2016 depending on requirements. - Mortality rate of Locust populations in the treated areas is over 85 percent. - Number of infested locust regions is reduced (reference is the map dated 30 June 2015). - Number of staff trained/retrained in campaign management and aerial and ground spraying techniques. - Relative significance of damage to crops and pastures.	- Consultants' reports. - Daily helicopter flight logbooks. - Graphic outputs of treated areas. - Number of flying hours used/number of flying hours planned. - Maps of locust-infested regions for the 2015/16 campaign. - Ten-day and monthly bulletins from the Locust Watch Unit. - Interim and final reports from the Programme. - Assessment report for the 2015/16 campaign. CFSAM report (FAO, WFP and Government assessment report on food security in Madagascar)	

Activities of Component 2	Sub-activities of Component 2	Workplan of activities												
		S	O	N	D	J	F	M	A	M	J	J	A	S
Activity 2.1. Strengthening human capacity for locust control	2.1.1. Provide technical assistance in campaign management and locust control throughout the campaign.	x	x	x	x	x	x	x	x	x	x			
	2.1.2. Continue to organize trainings and refreshing courses (mainly on-the-job) in (a) campaign management for about ten locust control staff; (b) ultra-low volume aerial and ground spraying techniques including biopesticides for locust control staff assigned to the seven anti-locust areas and around twenty locust control agents assigned to the aerial base from the CNA, the Plant Protection Directorate, the Regional Agricultural Development Directorates and the CALAT.		x	x	x	x	x	x	x	x	x			
Activity 2.2. Support for locust control operations	2.2.1. Procurement or triangulation, pre-positioning and distribution of pesticides needed for the campaign at storage facilities and aerial base throughout the campaign (100 000 litres of conventional pesticide, 50 000 litres of insect growth regulator and 1 000 kg of biopesticide).	x	x	x	x	x	x	x	x	x	x			
	2.2.2. Procurement and distribution of equipment needed for control operations from October 2015 at the aerial base (personal protective equipment, camping, IT equipment and tyres for 4x4 vehicles and motorbikes).	x	x	x	x									
	2.2.3. Establishment of a fully operational and secure aerial base (by awarding contracts to an airline company and mobilizing a helicopter and personnel). Ground control teams also fully operational.		x	x	x	x	x	x	x	x	x			
	2.2.4. Implementing the aerial control plan in infested areas: 480 hours flown for control operations from October 2015 to June 2016 to treat an area of 300 000 to 400 000 hectares.		x	x	x	x	x	x	x	x	x			

Component 3. Preserving human health and protecting the environment															
Expected outcome: No incidents affecting human health during aerial control operations or the handling of pesticides are reported; the impact on the environment from control operations is limited.	- Number of incidents reported affecting human health during aerial control operations or the handling of pesticides. - Number and severity of any potential incident caused by control operations on the environment. - Number of agents trained in monitoring the impact of treatments on human health and the environment, the use of PSMS and the use of a drum crusher.	- Consultants' reports. - Ten-day and monthly bulletins from the Locust Watch Unit. - Assessment report for the 2015/16 campaign. - Interim and final reports for the Programme.													
Activities of Component 3	**Sub-activities of Component 3**		**Workplan of activities**												
			S	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**
Activity 3.1. Strengthening human capacity for human health preservation and protection of the environment.	3.1.1. Provide technical assistance in monitoring the impact of treatment on human health and the environment throughout the campaign.			x	x	x	x	x	x	x	x	x			
	3.1.2. Continue to organize training (mainly on-the-job) for the agents allocated to the aerial base, seconded from the CNA , the Directorate of Plant Protection and the Regional Agricultural Development Directorates: 25 people in monitoring the impact of treatments on human health and the environment; three people in expanding the PSMS; five people in the use of drum crushers; 30 people in all aspects of pesticide management and mitigation measures of the impact of treatments on human health and the environment (including storage, transport and handling of pesticides, etc.).			x	x				x		x				
	3.1.3. Make recommendations on the revision of the environmental specifications.			x	x	x	x	x	x						
Activity 3.2. Support for mitigating and monitoring the impact of treatment on human health and the environment	3.2.1. Implement the Human Health and Environment Management Plan throughout the campaign.		x	x	x	x	x	x	x	x	x	x			
	3.2.2. Support for the team monitoring the impact of treatments on human health and the environment at the aerial base and for the entire duration of control operations.			x	x	x	x	x	x	x	x	x			
	3.2.3. Support and strenghtening of the pesticide stock and empty drums management team during the campaign.			x	x	x	x	x	x	x	x	x			
Activity 3.3. Construction of the pesticide storage facility	3.3.1. Construction of the pesticide storage facility in Toliara (land and plans already available).		x	x	x	x	x	x	x	x	x	x			

Component 4. Implementing and coordinating the Programme

Expected outcome: the supervision and technical and operational coordination of the overall Programme, as well as those of the specific field operations, are performed and adjusted if needed, enabling the expected outcomes of the campaign and Programme to be achieved.	- The supervision and coordination mechanism is effective and efficient. - The anti-locust campaign functions as planned. - Positive results for the campaign overall.	- Consultants' reports. - Ten-day and monthly bulletins from the Locust Watch Unit. - Assessment report for the 2015/16 campaign. - Interim and final reports from the Programme.													
Activities of Component 4	**Sub-activities of Component 4**		**Workplan of activities**												
			S	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**
Activity 4.1. Strengthening management and coordination capacities for locust emergencies	4.1.1. Implement the National Locust Emergency Plan and mobilize CIPA in the Ministry of Agriculture in Antananarivo.			x	x	x	x	x	x	x	x	x			
Activity 4.2. Coordination of the Programme	4.2.1. Implement the Programme effectively and efficiently by ensuring: - daily supervision and coordination of field operations thanks to an international technical expertise; - operational, administrative and financial management of the Programme by the FAO Representation in Madagascar; - supervision and technical coordination of the Programme by FAO headquarters.		x	x	x	x	x	x	x	x	x	x			
	4.2.2. Global assessment of the implementation and coordination management of the Three-year Programme (2013–2016) by the FAO Office of Evaluation											x	x	x	x
Activity 4.3 Support the transition towards a preventive control strategy	4.2.3. During an *ad hoc* workshop, draw up a preliminary overview of the results achieved during the Three-year Programme, learn lessons from conducting a programme such as this and define the main steps to implement a preventive control strategy in Madagascar.										x	x			

Component 5. Assessing the effectiveness of the anti-locust campaign and the impact of the locust crisis on crops and pastures			
Expected outcome: The	- Results of the assessment of the anti-locust campaign and	- Assessment report for the	

assessment results regarding the locust campaign's effectiveness and the impact of the locust crisis on crops and pastures and ultimately, on the food and nutrition security of affected populations, are available to all stakeholders.	of the Programme are available and published. - Results of the assessment of the impact of the locust plague on crops and pastures as well as the food and nutrition security of affected populations are available and published. - Lessons on implementing a large-scale programme are learnt by stakeholders with the aim of implementing an effective and sustainable preventive control strategy in Madagascar, with continuous political and financial support from national authorities.	2015/16 campaign. - CFSAM report. - Report from the end-of-campaign workshop. - Interim and final reports for the Programme.													
Activities of Component 5	**Sub-activities of Component 5**		**Workplan of activities**												
			S	**O**	**N**	**D**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**
Activity 5.1. Assessing the effectiveness of the anti-locust campaign	5.1.1. Document the technical, socio-economic and environmental appropriateness of the anti-locust campaign and of the Three-year Programme as a whole.											x	x	x	
Activity 5.2. Assessing the impact of the locust crisis on crops and pastures.	5.2.1. Quantify and characterize the impact of the locust plague on food security in order to define, if necessary, effective and appropriate emergency countermeasures for households affected by the locust crisis.											x	x	x	

FOOD CHAIN CRISIS
Management Framework

The Food Chain Crisis Management Framework (FCC) supports FAO member countries in the fight against threats to the human food chain at all stages from production to consumption.

Such threats emerge from transboundary animal, fish and aquatic diseases, plant and forest pests and diseases, food safety hazards, and nuclear and radiological incidents.

The Three-year Emergency Programme in response to the locust plague in Madagascar is implemented through the FCC.

www.fao.org/food-chain-crisis

LOCUST CRISIS
MADAGASCAR