



# Locust and grasshopper management in drylands: Can biological control be considered as a viable solution?

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KNOWLEDGE FOR LIFE





# CABI

- **not-for-profit** intergovernmental organisation, established by a United Nations-level agreement
- owned by **49 member countries**, which have an equal role in the organisation's governance, policies and strategic direction
- **over 480 staff worldwide**
- addresses issues of global concern such as **food security** and **food safety**, through research and international development cooperation
- major publisher of scientific information – books, e-books, full text electronic resources, compendia and online information resources



# What is the damage potential of Desert Locusts (*Schistocerca gregaria*)?

- During plagues, it **can easily affect 20 percent of the Earth's land**, more than 65 of the world's poorest countries, and potentially damage the livelihood of one tenth of the world's population
- **Locusts have a high capacity to multiply, form groups, migrate** over relatively large distances (they can fly up to 150 km per day) and, if good rains fall and ecological conditions become favourable, rapidly reproduce and increase some 20-fold in three months
- **Locust adults can eat their own weight every day**, i.e. about two grams of fresh vegetation per day. A swarm the size of Bamako, Niamey or Paris will consume the same amount of food in a single day as half the population of Mali, Niger and France respectively.
- <http://www.fao.org/food-chain-crisis/how-we-work/plant-protection/locusts/en/>



# How big is the current locust outbreak in Africa?

**Outbreak has reached 23 countries so far, potentially impacting 42 million people**

- During quiet periods (known as recessions) Desert Locusts are usually restricted to the semi-arid and arid deserts of Africa, the Near East and South-West Asia that receive less than 200 mm of rain annually. This is an area of about 16 million square kilometres, consisting of about 30 countries.
- As of June 2020, the current upsurge is affecting countries in East Africa, the Near East, and Southwest Asia.
- Yemen is also seeing a great locust activity which is particularly problematic due to a lack of response capacity and the inaccessibility of certain areas.
- <http://www.fao.org/locusts/en/>





# How big is the locust occurrence in other areas of the world?

- **Pakistan** – Shaheed Benazirabad district has reported 15.9 million ton losses (NLCC situation report 6th July 2020)
- **India** – locusts had spread to 44 districts in seven states; control works were done on 70,728 ha and, nine states are on high alert for a possible attack, as of June 7, India had never faced a locust attack of such proportion (<https://www.downtoearth.org.in/news/climate-change/locust-swarms-how-the-other-plague-is-affecting-several-states-72134>)
- **Nepal** - An estimated 8 million locusts in 6 swarms entered Nepal from India; spotted in 52/77 districts as of June 30 (<https://kathmandupost.com/national/2020/07/07/weather-comes-to-farmers-rescue-as-locust-swarms-disappear-inside-Nepal>)
- **Middle East countries** – also affected
- **South America** – **Argentina** and **Brazil** are tracking a swarm of about 40 million locusts (<https://www.reuters.com/article/us-argentina-brazil-grains-locusts/argentina-brazil-monitor-massive-locust-swarm-crop-damage-seen-limited-idUSKBN23W34K>)

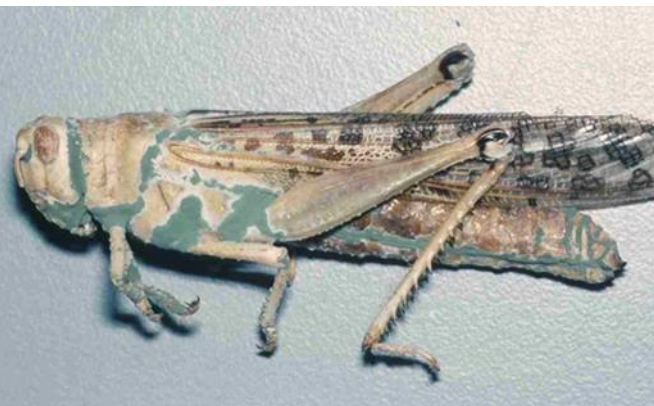
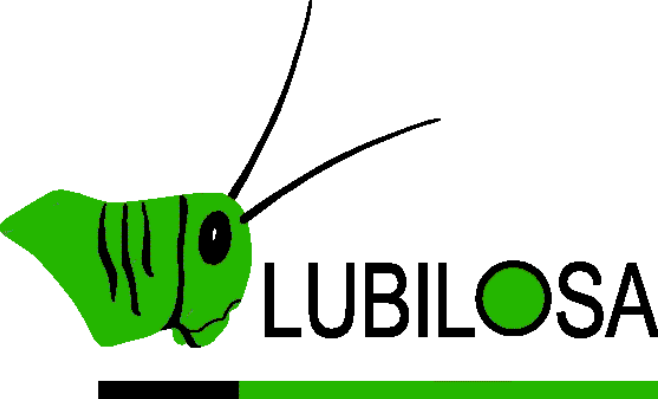


## How high is the impact on the economy and livelihood?

- Desert locust numbers are the worst in three generations and could cost East Africa and Yemen **\$8.5 billion** this year, the World Bank has said (Geographical, July 2020)
- During the last locust outbreak from 2003 to 2005, which **impacted 20 countries**, mostly in Africa, children were less likely to go to school, and girls were disproportionately affected. This is likely to be the case again in 2020 where **women and girls are affected more** than their male counterparts <http://news.care.org/article/locust-swarms-of-biblical-proportions-put-millions-at-risk-of-starvation/>

The Afrinik News, 14<sup>th</sup> April 2020





## How did it start - the search for an alternative control option?

- LUBILOSA = LUtte Biologique contre les LOcustes et les Sauteriaux
- 13 year (1989-2002) CABI led research programme aimed to develop a **biological alternative** to chemical control of locusts and grasshoppers
- Identified an isolate, ***Metarhizium acridum*** – went through all the necessary steps to **develop the commercial biopesticide Green Muscle**
- **Donors:** CIDA, DFID, DGIS, SDC, USAID
- **Partners:** CABI (Lead), IITA, GTZ, CILSS/ AGRHYMET/ DFPV
- **Collaborators:** the Plant Protection Services of Benin, Niger, Mali, South Africa, Sudan, Ghana, Chad, Senegal, Gambia, Burkina Faso, Agriculture and Agri-Food Canada, Universities of Basel, Reading and Bath
- **Cost:** £10.2 million

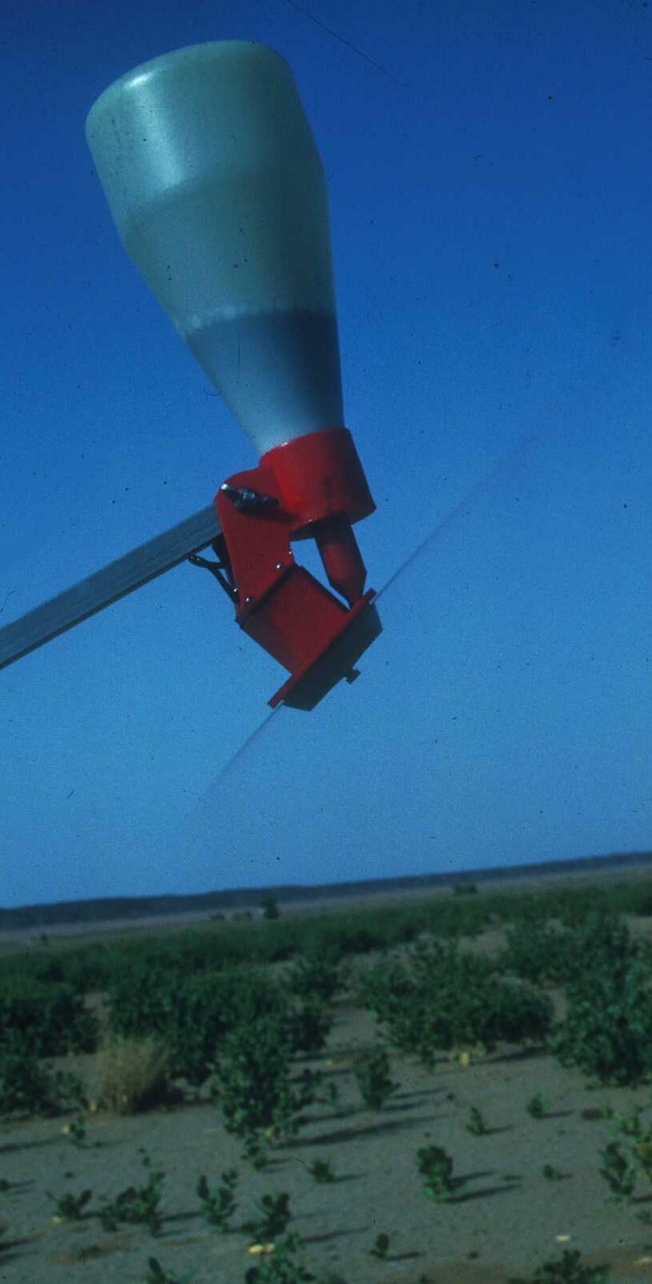
<https://en.wikipedia.org/wiki/LUBILOSA>



# Is the biopesticide product Green Muscle recommend for use?

- The Pesticide Referee Group set up by the FAO as an independent advisory body in 1989
- At the 6th meeting in 1996, the group **recommended Green Muscle especially for use in ecologically sensitive areas**
- Expert Consultation and Risk Assessment on the Importation and **Large-Scale Use** of Mycopesticides against Locusts, Rome, 2-7 December 2001 (FAO, 2002). **Recommended use of Green Muscle**
- Currently, *Metarhizium* is the only mycopesticide recommended by FAO for use against desert locusts. There are 10 chemical pesticides recommended for use
- Most effective when used as a preventative measure i.e. on juveniles

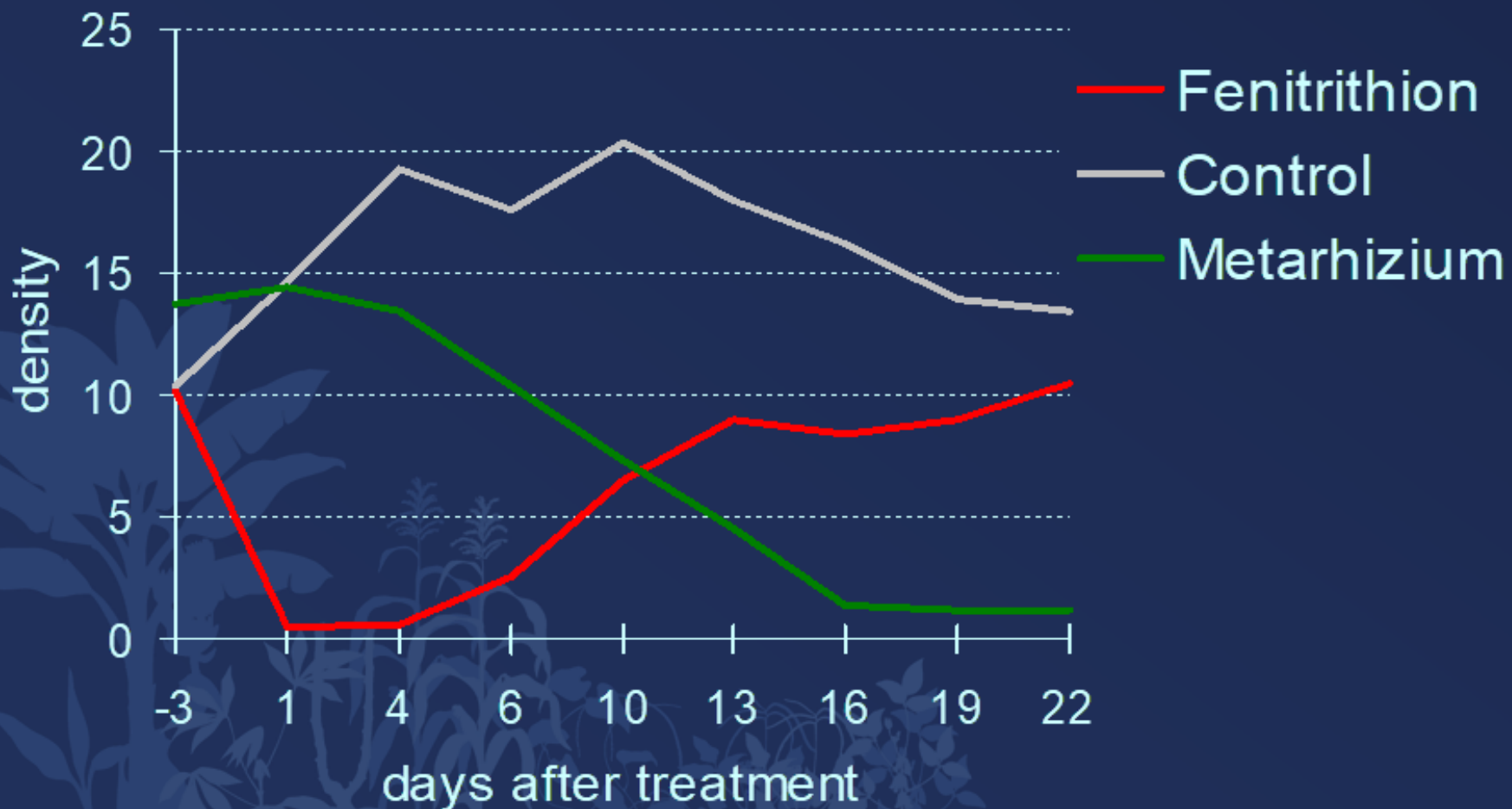




## How was the biopesticide product Green Muscle® being tested?

- Field tested in over 17 countries
- On over 17 species of grasshoppers and locusts (e.g. Senegalese grasshoppers, African rice grasshoppers, variegated grasshoppers, Sahelian tree locusts, desert locust)
- Trials demonstrated that *Metarhizium*, at a dosage of 50g/ha, could reduce grasshopper populations and locusts by 80-90% within two to three weeks
- **Green Muscle® is effective against all instars, nymphs and adults of grasshoppers and locusts**

# 1997: Mean grasshopper population density after application of *Metarhizium* at 100 g/ha and Fenitrothion at 250 g/ha on 800 ha plots





# Is the biopesticide product a viable alternative control option?

**Pesticide Environmental Accounting (PEA) - External costs of pesticide used in desert locust control in Senegal, 2003-2005**

Chemical average PEA costs:

EQ category	Externalities (€/kg of ai)	
Applicator effects	€	3.49
Rural inhabitant effects	€	6.02
Consumer effects	€	6.08
Ground water	€	2.21
Aquatic effects	€	1.67
Bird effects	€	1.08
Bee effects	€	6.40
Beneficial insect effects	€	1.23
Column totals	€	28.17

***Metarhizium:***

**€0.12/kg a.i.**

Leach et al., 2015 Spatial and Historical Analysis of Pesticide Externalities in Locust Control in Senegal - First Steps. DOI: 10.13140/RG.2.1.4543.1127

# How to apply the biopesticide product?

- Ultra low volume (ULV) via hand, ground vehicle or airplane
- Oil based formulation – for Green Muscle just suspend spores in locally obtained diesel oil
- Typically 1 litre formulation per hectare
- Green Muscle recommended at 50g/ha







## What personal protective equipment is required for the application?

- Fungal spores are a proteinaceous dust
- Some people, especially those who suffer from hay fever, are sensitive to breathing in the spores
- Extra care must be taken when using large quantities of spores i.e. preparing the formulations
- **Always** wear a dust mask and appropriate clothing



## How to source the biopesticide product Green Muscle?

- Source of Green Muscle: Éléphant Vert
- Registered in Kazakhstan, Uzbekistan, West Africa (CSP), Madagascar
- Obtained provisional sales authorizations in Kenya, Ethiopia, Somalia, Saudi Arabia
- Under registration in Morocco, Algeria, Tunisia
- Has been registered, & needs to be renew in Sudan, South Africa, Mozambique, Zambia, Malawi, Zimbabwe, Tanzania and Yemen
- Approved and recommended by FAO and has been used in large scale in Madagascar (60 000 ha), Tanzania (10 000 ha), and Somalia (spraying on going on 80 000 ha)
- <http://en.elephant-vert.com/news-media/news/cabi-teams-up-with-elephant-vert-to-fight-crop-destroying-locusts-and-grasshoppers/>







## Are there other biopesticide products available elsewhere?

- Green Guard®, BASF, has been used operationally since 2000, with more than 100,000 ha of locust and grasshopper infestations treated between 2000 and 2009 but this only accounts for around 10% of the area sprayed (Hunter, 2010)
- Registered in Australia
- For use in pasture crops, table and wine grapes, forage crops and non-crop areas
- [www.crop-solutions.basf.com.au](http://www.crop-solutions.basf.com.au)



