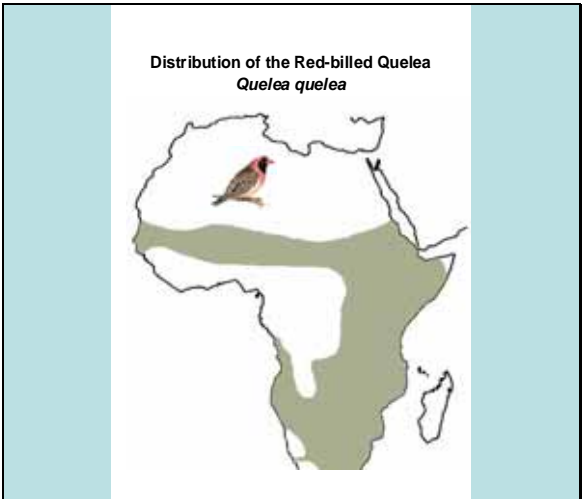


***Environmental and Human Health Impact Assessment of Quelea bird control in southern Africa and novel means of harvesting quelea birds for protein and income generation.***



*Quelea quelea* occurs as four different sub-species

- 1. *Quelea quelea quelea* West Africa
- 2. *Quelea quelea aethiopica* North-East Africa
- 3. *Quelea quelea intermedia* East Africa
- 4. *Quelea quelea lathamii* southern Africa

**Damage**

- Any small-grain cereal grown in semi-arid parts of Africa is a potential target
- Damage is especially likely when the birds' preferred wild food is unavailable.
- US\$5.4 million worth of grain loss due to Quelea damage in Kenya and Tanzania in 1978-79 (FAO 1981).
- Annual losses in Africa US\$ 45 million (Elliott 1989).



## CONTROL

- EXPLOSIVES
- SPRAYING WITH FENTHION
- BIRD-RESISTANT VARIETIES
- CULTURAL CONTROL

## The target: breeding colonies (and roosts)



## Control Methods

- Ground or aerial application of Queletox® (60% fenthion, usually at 4 litres/hectare in ULV formulation) or Falcolan® (active ingredient cyanophos 520 g/l) at an application rate of 10 l/ha to breeding colonies and night roosts.
- Fire-bombs detonated with explosives using paraffin and / or petrol at application rates ranging from 1050 - 2500 l/ha



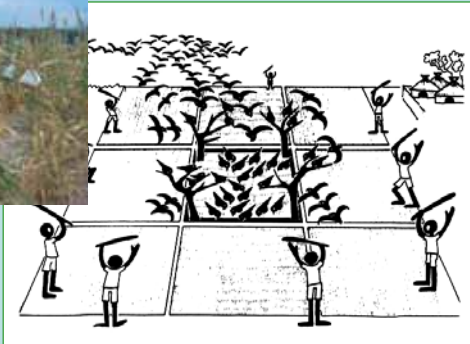
Aerial spraying of fenthion (Queletox®)

Gelignite + diesel explosions





### Traditional bird scaring



### Damage

- Dry Season  
*Irrigated crops affected e.g. wheat*
- Early rainy season after “Early-rains migration”  
*Irrigated crops e.g. rice and early ripening rain-fed crops*
- Rainy season  
*Rain-fed crops e.g. sorghum, millet*

### Objectives

- 1. *To assess environmental impacts of spraying quelea birds with organophosphate avicides (fenthion and cyanophos) in Botswana and Tanzania*
- (1.1) To determine the level of acetylcholinesterase in human and livestock blood in populations at risk and confirm links between acetylcholinesterase depression and levels of organophosphate poisoning;
- (1.2) To measure acetylcholinesterase levels and organophosphate residue levels in unsprayed and sprayed birds and mammals, evaluate levels in non-target vertebrates, and assess health risks of consuming sprayed birds;
- (1.3) To determine organophosphate residue levels in soil and vegetation, air and water;
- (1.4) To assess changes in invertebrate populations.

### Objectives

- 2. *To assess environmental impacts of controlling quelea birds with explosives (TNT ignition of diesel or petroleum or fuel mixtures) in Botswana*
- (2.1) To determine effects on non-target vertebrates;
- (2.2) To determine fuel residue levels in soil and vegetation;
- (2.3) To determine effects on invertebrates and vegetation recovery.

### Objectives

- 3. *To assess potential of mass-trapping and colony harvesting methods for quelea control in Botswana and Tanzania and the potential for use of quelea as food and for income generation.*
- (3.1) To determine the feasibility of mass-trapping techniques using nets for controlling quelea birds;
- (3.2) To determine the feasibility of harvesting chicks manually from colonies;
- (3.3) To evaluate means of preserving harvested quelea birds for use as food;
- (3.4) To assess the economic potential and livelihood benefit of control by harvesting.

### Objectives

- 4. *To recommend mitigation measures*
- (4.1) To improve existing protocols for quelea bird control in order to minimise environmental damage and non-target mortality, as well as safeguarding the health of livestock and people.

## Objectives

- 5. To train pest control staff of national agricultural services in Botswana and Tanzania in environmental impact assessment methods and disseminate environmentally-friendly control techniques and protein and income generation methods to target groups

(5.1) To provide in-service training in Environmental Impact Assessment (EIA) methods and quelea management to national agricultural services.

- (5.2) To communicate environmental awareness and results of EIA and harvesting methodologies to stakeholders and target groups in the SADC region.

## RESULTS

### PREPARATORY ACTIVITY 1

- Workshop was 6-8 December 2006 at the Plant Protection Research Institute (PPRI), Pretoria, South Africa.
- Attended by delegates from Botswana, South Africa, Tanzania & UK
- Programme agreed



## RESULTS OBJECTIVE 1

- (1.1) To determine the level of acetylcholinesterase in human and livestock blood in populations at risk and confirm links between acetylcholinesterase depression and levels of organophosphate poisoning;
- Appropriate blood samples collected near Dodoma, Tanzania, 2008. Results to be presented by E. van der Walt.



## RESULTS OBJECTIVE 1

- (1.2) To measure acetylcholinesterase levels and organophosphate residue levels in unsprayed and sprayed birds and mammals, evaluate levels in non-target vertebrates, and assess health risks of consuming sprayed birds;
- Blood samples collected from approx 300 birds in Botswana and Tanzania. Significant post-spray reductions in acetylcholinesterase detected in birds and mammals, link with OP residues to be confirmed.

## Bird blood analyses



## Mammal blood analyses



## RESULTS OBJECTIVE 1

- (1.3) *To determine organophosphate residue levels in soil and vegetation, air and water;*
- Fenthion residues ranging from 0.019 to 14.319 µg/g (ppm) of soil were detected in post-control soil samples collected in Botswana. Upper values unacceptably high and above the maximum residue levels for food of different types (0.01-3 µg/g).
- Soil and vegetation samples collected in Tanzania but no residues detected, as spray target missed. A few non-target animals collected for analyses after fenthion sprays in Botswana and Tanzania in 2008. Results to be presented by E. van der Walt.

## RESULTS OBJECTIVE 1

- (1.4) *To assess changes in invertebrate populations.*
- No data to date.

## RESULTS OBJECTIVE 2

- 2. *To assess environmental impacts of controlling quelea birds with explosives (TNT ignition of diesel or petroleum or fuel mixtures) in Botswana*  
(2.1) *To determine effects on non-target vertebrates;*
- (2.2) *To determine fuel residue levels in soil and vegetation;*
- (2.3) *To determine effects on invertebrates and vegetation recovery.*

No data yet as no explosions monitored.  
Planned for Botswana during 2009.

## RESULTS OBJECTIVE 3

- 3. *To assess potential of mass-trapping and colony harvesting methods for quelea control in Botswana and Tanzania and the potential for use of quelea as food and for income generation.*  
(3.1) *To determine the feasibility of mass-trapping techniques using nets for controlling quelea birds;*
- (3.2) *To determine the feasibility of harvesting chicks manually from colonies;*
- (3.3) *To evaluate means of preserving harvested quelea birds for use as food;*
- (3.4) *To assess the economic potential and livelihood benefit of control by harvesting.*

## RESULTS OBJECTIVE 3

- 3. *To assess potential of mass-trapping and colony harvesting methods for quelea control in Botswana and Tanzania and the potential for use of quelea as food and for income generation.* (3.1) *To determine the feasibility of mass-trapping techniques using nets for controlling quelea birds;*
- Trials conducted in 2007 with "Tunisian" net and in 2008 with "USA design". A few birds caught but not as successful as mist-nets or Kondo basket traps

## "Tunisian" trap





### RESULTS OBJECTIVE 3

- (3.2) *To determine the feasibility of harvesting chicks manually from colonies;*
- Clearly feasible as conducted successfully by villagers at Chidilo, Tanzania during 2008.

Quelea chicks harvested by villagers at Chidilo, Tanzania, March 2008



### RESULTS OBJECTIVE 3

- (3.3) *To evaluate means of preserving harvested quelea birds for use as food;*
- Trials with smoked, dried and boiled quelea birds successful. Birds still edible after two months
- Trials of pickling to be conducted

Trappers plucking quelea birds



Boiling with a bit of salt



Drying of boiled quelea



One month after drying



One-month-old quelea fried in oil



One-month-old smoked quelea



Dried quelea prepared for food



### RESULTS OBJECTIVE 3

- (3.4) To assess the economic potential and livelihood benefit of control by harvesting.
- Successful trial at Kondoa.
- “35,000 quelea birds caught at Kondoa, while many more were caught in other villages. A result, very few quelea birds are available in Kondoa, where many people are involved in this business. At the moment few people can get them for food. It is a good achievement.”
- Milled quelea product made. Need commercial partner.

## Uvunaji wa Quelea quelea

Ndege wakubwa  
na  
makinda



## Vifaa vya Kuvunia

Nyavu  
na  
Matundu



## Ndege Waliokaushwa

Na  
Kuhifadhiwa  
Kitaalamu



## Viungo kwa ajili ya Mapishi ya Quelea

Quelea quelea kwa  
ajili ya mboga ya  
mchuzi inajuisha ;

- Nyanya
- Carots
- Pilipili hoho
- Limao
- Vitunguu maji/swaumu
- Pili pili mbuzi
- Nazi/ Maziwa



## Viungo kwa ajili ya Mapishi ya Quelea

Quelea quelea kwa ajili  
ya mboga ya mchuzi  
inajuisha ;

- Bamia
- Nyanya
- Carots
- Pilipili hoho
- Limao
- Vitunguu maji/swaumu
- Pili pili mbuzi
- Nazi/ Maziwa



## Viungo kwa ajili ya Mapishi ya Quelea

Quelea quelea kwa ajili ya  
mboga ya mchuzi  
inajuisha ;

- Njegere
- Nyanya
- Carots
- Pilipili hoho
- Vitunguu maji/swaumu
- Pili pili mbuzi
- Nazi/ Maziwa



### Viungo kwa ajili ya Mapishi ya Quelea



**Quelea quelea kwa ajili ya mboga ya mchuzi inajuisha ;**

- Nyanya
- Carots
- Pilipili hoho
- Maharage ya kijani/Njegere
- Nazi /Maziwa
- Vitunguu maji/swaumu



### Viungo kwa ajili ya Mapishi ya Quelea



**• Quelea quelea kwa ajili ya mboga ya mchuzi inajuisha ;**

- Mboga Kavu/Mbichi **Matembele** au **Kunde n.k**
- Nyanya
- Carots
- Ngogwe/Bilinganya
- Vitunguu maji/swaumu
- Nazi/ Maziwa



### Quelea quelea na mhogo



**Inajumuisha;**

- Ngogwe
- Carots
- Nyanya
- Maziwa/nazi
- Vitunguu



### Quelea quelea na viazi



**Inajumuisha;**

- Njegele
- Pilipili hoho
- Carots
- Nyanya
- Maziwa/nazi
- Vitunguu



### Quelea quelea na ndizi



**Inajumuisha;**

- Ngogwe
- Pilipili hoho
- Carots
- Nyanya
- Maziwa/nazi
- Vitunguu



### Quelea quelea na ugali



**Inajumuisha;**

- Ngogwe
- Bamia
- Pilipili hoho
- Carots
- Nyanya
- Maziwa/nazi
- Vitunguu



## Quelea quelea na wali mweupe



### Inajumuisha;

- Ngogwe
- Bamia
- Pilpili hoho
- Carots
- Nyanya
- Maziwa/nazi
- Vitunguu
- Matunda

## Quelea quelea na wali wa Pilau



### Inajumuisha;

- Bamia
- Bilinganya
- Carots
- Nyanya
- Maziwa/nazi
- Vitunguu
- Matunda

## RESULTS OBJECTIVE 4

- 4. To recommend mitigation measures
- To await final results of project

## RESULTS OBJECTIVE 5

- 5. To train pest control staff of national agricultural services in Botswana and Tanzania in environmental impact assessment methods and disseminate environmentally-friendly control techniques and protein and income generation methods to target groups.(5.1) To provide in-service training in Environmental Impact Assessment (EIA) methods and quelea management to national agricultural services.
- Formal training course for 19 Ministry of Agriculture staff "WORKSHOP ON ENVIRONMENTAL IMPACT ASSESSMENT OF QUELEA CONTROL AND MASS-TRAPPING OF QUELEA" held at the Impala Hotel, Arusha, Tanzania , 4 – 8 June 2007.

## WORKSHOP ON QUELEA EIA



## RESULTS OBJECTIVE 5

- In-service training conducted in field work including EIA for Collen Mberiki (Botswana), and for EIA and mass trapping for Shaban Katetemera, James Mabuga, Richard Magoma, Charles Materu, Boaz Mtobesya, Damas Shunbusho and Mohammed Zambo in Tanzania.

## RESULTS OBJECTIVE 5

- 5. *To train pest control staff of national agricultural services in Botswana and Tanzania in environmental impact assessment methods and disseminate environmentally-friendly control techniques and protein and income generation methods to target groups. (5.2) To communicate environmental awareness and results of EIA and harvesting methodologies to stakeholders and target groups in the SADC region.*
- Sensitisation on quelea conducted at farmers meeting in Tanzania
- Television film being made in Tanzania

## MINISTER OF LOCAL GOVT. VISITED QUELEA SECTION AT FARMER'S FESTIVAL



## DEPUTY MINISTER OF NATURAL RESOURCES VISITED QUELEA SECTION

