



Ministry of Agriculture and
Livestock Development
State Department for Agriculture

TECHNICAL BRIEF

RED-BILLED QUELEA BIRDS



EMERGENCY LOCUST RESPONSE PROGRAM



THE WORLD BANK





REDBILLED QUELEA BIRDS





FOREWORD

Red-billed quelea bird is a major pest of small-grain cereal crops such as rice, wheat, millet, teff, oats and sorghum throughout sub-Saharan Africa. Quelea quelea is a long-distance migrant bird whose complex movements vary annually according to variations in rainfall patterns. Under favourable ecological conditions, quelea birds breed in vast colonies and expand their distribution and Kenya is one of the countries in East Africa prone to quelea bird invasions.

During invasions, the birds stay in large roosts which can contain several millions of birds, these large roosts are the target for control operations during invasions. Invasion by Quelea quelea is a yearly occurrence in Kenya resulting in the loss of small grains (rice, wheat, millet, teff and sorghum), posing a serious threat to the national food and nutrition security. The frequency and scale of quelea outbreaks has increased in the recent past, an observation attributed to continuous cropping patterns especially under rice irrigation schemes.

Quelea is known for its rapid and prolific breeding leading to significant agricultural harm that can reach 100% crop loss if not controlled. Inadequate technical information on Quelea quelea by stakeholders in pest management has also contributed to inefficiencies in management. This technical brief provides summarized information on Quelea Quelea identification, biology and ecology, potential damage, management strategies and environmental health and safety considerations during the control operations. This document is intended for use by all the stakeholders in the Quelea Quelea management. It is envisaged that the information will result in more effective management of the birds.

The Department wishes to express sincere gratitude to The World Bank through the Emergency Locust Response Program (ELRP), for financial support in the development of this document. The department is also grateful to the Plant Protection and Food Safety Directorate (PP&FSD) team and the experts from collaborating institutions in the preparation of this document.

.....
.....

1.0 OVERVIEW OF THE RED BILLED QUELEA BIRDS (QUELEA QUELEA)

1.1 INTRODUCTION

The Red-billed quelea (*Quelea quelea*) is a granivorous ploceidae weaverbird. It is confined to semi-arid grasslands and savannas mixed with woodlands south of the Sahara in more than 25 countries. It is arguably the most abundant land-bird in the world (Erickson WA, 1989).

The Red-billed quelea birds frequently form large breeding colonies or roosting sites, with populations ranging from a few thousands to millions. They cause serious destruction to small grain crops such as sorghum, wheat, millet, rice, barley, teff and oats, particularly when their natural food of grass seeds is either seriously depleted or difficult to obtain.

Control of quelea birds in Africa has gone on for more than 40 years. Despite the extensive control efforts, quelea damage to crops has become more serious, due to land use changes that have resulted in reduction in their natural habitats. Moreover, the introduction of mechanized farming, coupled with the intensification and diversification of crop production, has modified their hither to natural grass habitats. Vast rain-fed and irrigated areas have been introduced for large scale production and have become new food resources for the bird pests. As a result, bird colonies are found in close proximity to crop fields and serious crop damage has been experienced (Elliott, 1989)..

Among African farmers, the quelea problem has existed for as long as cereal crops have been grown and its threat to the crops was traditionally met by scaring tactics. Quelea depredation was noticed in Africa in the early 1940s during World War II when farmers tried to grow cereals for surplus grain.





1.2 DISTRIBUTION AND HABITAT OF THE RED-BILLED QUELEA BIRDS

Quelea distribution is confined to Africa South of the Sahara in countries including; Senegal, Niger, Chad, Central African Republic, Sudan, South Sudan, Ethiopia, Eritrea, Somalia, Eastern Democratic Republic Congo, Kenya, Tanzania, Zambia, Zimbabwe, Angola, Malawi, Mozambique, Namibia, South Africa, Uganda, Rwanda and Burundi (Manikowski S, Bortoli L, N'Diaye A, 1989.)

In Kenya Quelea quelea prone counties include:- Meru, Laikipa, Nakuru, Uasin Gishu, Busia, Siaya, Kisumu, Migori, Narok, Kirinyaga, Kitui, Macahkos and Makueni.

The species is associated with three geographical zones: grass-steppe, dry savanna and montane-grasslands. Quelea is restricted to areas where the following ecological conditions prevail within these zones;

- o Annual rainfall of 300-800mm for successful breeding
- o Wide open grass plains and valleys but avoiding high altitudes or mountains with closed rain-forest and wet savanna bordering them;
- o Stagnant or slow-moving water sources;
- o Grasses with small seeds and high seed production; and
- o Reed and reed-like grasses, thorny shrubs and Acacia trees for building nests and roosting.

It avoids forests, including miombo woodlands and rainforests such as those in central Africa, and is generally absent from western parts of South Africa and arid coastal regions of Namibia and Angola.

Occasionally, it can be found as high as 3,000 m above sea-level, but mostly resides below 1,500 m. It invades agricultural areas, where it feeds on cereal crops, although it is thought to prefer small oval seeds of wild annual grasses such as those of guinea grass. It needs to drink daily and can only be found within about 30 km distance of the nearest body of water. It is found in wet habitats, congregating at the shores of water bodies. It needs shrubs, reeds or trees to nest and roost.

1.3 IDENTIFICATION AND TAXONOMY

Over 75% of males have a black facial "mask", comprising a black forehead, cheeks and higher parts of the throat. Occasionally males have a white mask. The mask is surrounded by a variable band of yellow, rusty, pink or purple. White masks are sometimes bordered by black. This coloring may only reach the lower throat or extend along the belly, with the rest of the underparts light brown or whitish with some dark stripes.

The upper parts have light and dark brown longitudinal stripes, particularly at mid length, and are paler on the rump. The tail and upper wing are dark brown. The flight feathers are edged greenish or yellow. The eye has a narrow naked red ring and a brown iris. The legs are orangey in color. The bill is bright raspberry red.

Outside the breeding season, the male lacks bright colors; it has a grey-brown head with dark streaks, whitish chin and throat, and a faint light stripe above the eyes. At this time, the bill becomes pink or dull red and the legs turn flesh-colored.

The females resemble the males in non-breeding plumage, but have a yellow or orangey bill and eye-ring during the breeding season. At other times, the female bill is pink or dull red.

The red-billed quelea is a small bird approximately 12 cm long in size and weighing 15–26 g.

Taxonomic Tree

Kingdom:	Metazoa
Phylum:	Chordata
Subphylum:	Vertebrata
Class:	Aves
Order:	Passeriformes
Family:	Ploceidae
Genus:	Quelea
Species:	Quelea Quelea



Figure 1: Female (Left) and Male (Right) in breeding plumage



Figure 2: Appearance of both sexes in non-breeding state



2.0 ECOLOGY AND BIOLOGY OF THE RED BILLED QUELEA BIRDS

2.1 FEEDING

Quelea are mainly dependent on wild grasses such as (*Sorghum* sp., *Oryza* sp., *Echinochloa* sp., *Panicum* sp., and *Urochloa* sp.). When the wild sources of food are depleted they attack cultivated crops such as wheat (*Triticum* sp.), rice (*Oryza* sp.), millet (*Pennisetum* sp.), Teff (*Eragrotis*) and sorghum (*Sorghum vulgare*) as their food sources throughout the year. Food preference is for small sized seeds of low tannin content during susceptible stages (Jarvis MJF, Vernon CJ, 1989).

In the breeding season, quelea catch insects, which they feed to their nestlings during their first few days of life, together with seeds at the milky stage. Such insects include grasshopper nymphs, caterpillars, small beetles and winged termites. During the breeding season, quelea extract seeds by perching on cereal heads and grass stems. This feeding activity continues throughout much of the day. In the roosting season, quelea collect dry shed seeds from the ground during two feeding sessions, at early morning and late afternoon.

2.2 BREEDING BIOLOGY

The breeding time for quelea is determined by the occurrence of high-quality food, which is used for the nourishment of their young. Such conditions are available during the wet season after the rains have fallen for 4-9 weeks. Since these conditions are prevalent for a short period of time, quelea are physiologically triggered by

environmental cues which are believed to be the onset of the rainy season or the appearance of green vegetation.

Quelea nest on reeds, shrubs or thorny Acacia trees. Breeding colonies vary in size, ranging from one to a few hundred hectares. The nest density ranges from 30-1,000 nests per tree, depending on the vegetation type, height and density. Quelea are monogamous, with an average clutch size of three whitish-blue eggs. Quelea start to breed at 9-12 months and at least one breeding attempt is made in a year. Under optimal ecological conditions, quelea are expected to breed three times a year.

Nest-building, which is performed solely by the male, takes about two days. Incubation of eggs is shared by both sexes and takes a period of 10-12 days. Fledglings leave their nest at an age of 11-13 days, perching on top of their nests and jumping from one branch to the other. The whole breeding cycle takes about 42 days, when the young become independent and are abandoned by their parents. For the first few days after hatching, the young are fed with a mixture of soft grass seeds and insects. The activities of nest building, courtship and egg-laying cause physical stress to quelea, resulting in a bodyweight loss of up to 15 %.

2.3 ROOSTING

Once breeding is over, quelea typically assemble in roosting sites in Acacia or reeds besides water sources. They roost in large numbers estimated to be hundreds, thousands or millions. The size and number of birds in a roost largely depends on food and water availability in the surrounding area. The main roosts are occupied only during the night, while during the hot hours of the day they roost in small numbers near water sources (Grange, 1989).

In the early morning, for about 15 minutes, quelea stream out from their roosts in small flocks to drink and travel distances of up to 30 km in search of food. They feed intensively during early morning and late afternoon.

Quelea birds drink at least twice a day; in the morning shortly after leaving their roost and during the hot midday hours and/or en-route to their night roosts. They return to their night roosts about 45 min before dark, but they finally settle in the last 20 minutes before dark. The size of feeding flocks varies from less than a hundred to many thousands of individuals. As the dry season advances, food becomes less available and flocks tend to increase in size.

The feeding flock flies in spiral and wave formations over the feeding ground, continually changing its shape and, as it settles to feed for any length of time, is joined by an increasing number of other groups. As a result of this display, a small group which has found a good feeding place may swell into an enormous flock in a matter of minutes, while a real swarm which is unlucky may dwindle to nothing with equal rapidity.

2.4 MIGRATION

Red-billed Queleas migrate at the beginning of the wet season, away from their dry-season concentration areas and towards areas where rain started several weeks earlier or to where it has not yet rained. Considerable fat deposits are accumulated for the migration (Ward, 197).

The rain systems move across the African continent at different times of the year according to the slow seasonal movement of the Inter Tropical Convergence Zone (ITCZ). This movement causes differences in the timing of grass seed and small grain maturity from one region to the other. Accordingly, quelea migrate in search of their preferred food from one region to another north and south of the equator.

During their journeys, individuals in breeding condition stop to breed (in large aggregations) wherever they find conditions suitable for establishment of colonies.

The birds, which first bred in the early-rains areas, continue migrating along the advancing rain fronts to regions of seeding grasses and breed again. Such breeding may be attempted two or more times in the same rainy season, but hundreds of kilometers apart.



3.0 DAMAGE CAUSED BY THE RED-BILLED QUELEA BIRDS

Quelea is capable of causing serious damage to cultivated crops. An individual quelea can eat 3-5g of grain per day and waste a lot more on the ground by its feeding activity. As a result, total damage by an individual bird can reach 7-10g of grain in a day (CABI, digital library). Thus, one million birds, which is a relatively small number in a single roost, can destroy up to 10 tons of 7-10 g of grain a day. This is equivalent to a monetary loss of Kes 800,000 per day if the birds are feeding on rice and given that the grain filling and hardening period for grains is 30 about days, it translates into a loss of 24 million shillings in a single season. Given there

are usually two growing seasons in a year, the losses can be substantial if the birds are not controlled. The price of a kilogram of paddy rice was 80 kes (Kenya National Bureau of Statistics, 2024)

Damage by birds can be recognized by broken seeds left on the heads and the husks of the grains that are left on the ground. At the milky stage damaged grains look shrunk, with a white deposit outside the glumes as a result of the birds pinching the seeds in their breaks. In the case of crops with small seed size (e.g.millet) the whole grain is consumed.



4.0 MONITORING

The objective of a quelea monitoring system is to provide an inflow of information which can serve national and regional interests.

Monitoring at the national level provides information on the possible time the birds arrive in traditional breeding areas, the magnitude of the problem and the damage likely to occur.

Quelea is a transboundary pest and its monitoring requires a regional approach. A neighboring country can be advised of an imminent bird attack due to large scale breeding that is taking place near its borders. Therefore, regional information and reporting are essential for improved quelea management. Monitoring quelea improves control strategies by identifying sources of birds and through understanding their movements and migration patterns.





5.0 MANAGEMENT OF QUELEA BIRDS

5.1 PHYSICAL AND MECHANICAL CONTROL METHOD

- o Scaring by humans, drum beats, shouting, and commercial bird scaring devices, predator-shaped-like machines, artificial noisy devices to scare quelea birds away may be used. However, some of these devices may be expensive and birds become accustomed to them over time.
- o Birds can be trapped and harvested for consumption as they provide a nutritious source of protein. Several trapping devices methods exist such as Basket traps, False water traps, Netting trapping (Jarvis MJF, Grange MLa, 1989). However, the numbers of birds harvested are minimal compared to the population in roosts or colonies.
- o Covering of crop fields with nets is also a bird's protective measure although the practice is only effective to smaller sized gardens due to the cost attached to its application.
- o Removal of grasses from the crop field reduces Quelea bird's infestation as they feed on grasses. Weeds attract Quelea birds into crop fields whereby they gradually shift their feeding source to the cereal grains as the grains ripen. Therefore, it is advisable for the farmers to continuously remove unwanted plants off the crop in time.
- o The fire-bombs are used to destroy the vegetation where birds roost or nest. Skilled personnel are required to handle the explosion and special equipment during transportation and its operation. The method poses danger to the operator and extra precautions are required for the safety of the operator and the surrounding environment.
- o Chick harvesting where nests are destroyed using hooks and long poles as well as cutting down the trees and chicks harvesting (Elliott CCH, Mtobesya BN, Cheke RA, 2013). The method is only successful if carried out after the birds have laid their eggs or otherwise the birds easily repair the nest or rebreed somewhere else. And this method might promote deforestation.
- o Shooting birds using a catapult or slingshot can kill one bird at a time using a single stone per shot. It is a time-consuming and ineffective technique.



5.2 AGRONOMIC CONTROL METHODS

- o Planting and harvesting time Manipulation eg., planting early and harvesting before the breeding season of the birds can avoid destruction by young ones after the breeding season (Elliott CCH, 1979).
- o This control technique is more effective with the irrigation crops compared to rain-fed ones. Preferably short duration crop varieties will be favorable for this technique.
- o Planting Quelea resistant crop cultivars may also reduce the damage such as grain varieties with awns or improved crop varieties with hard seeds to pluck, breeding seeds with high tannin content among others



5.3 AERIAL OR GROUND PESTICIDE SPRAYS USING FENTHION ULV

Aerial operations involve the use of either fixed-wing or rotary aircraft. Aircraft are used for large sites, and also for those sites which are inaccessible to ground sprayers. For ground sprays, vehicle mounted sprayers may be used if the area is motorable and Motorised sprayers in small roosts which are not accessible by a vehicle.



5.4 BLASTING

This involves the use of agricultural explosives to control the birds in their roosts, the explosives produce fire which destroys the vegetation of the roost and the birds. This is done by a trained officer who must be licensed by the department of Mines and Geology to handle explosives.



6.0 ENVIRONMENTAL, HEALTH AND SAFETY

6.1. INTRODUCTION

Pesticides used for management of Quelea birds are toxic and potentially hazardous to humans, animals, other organisms, and the environment. A number of non-target organisms such as eagles, kites, small mammals and snakes are sometimes affected (McWilliam AN, Cheke RA, 2004). Therefore, people who use or regularly come in contact with pesticides must understand the relative toxicity, potential health effects, and preventive measures to reduce exposure to the products. Using pesticides safely depends on several factors. This includes selection of appropriate products depending on the target and use of the product as directed in the label. Every chemical product has a label that gives usage guides that minimize the hazards during and after use.

After control activity, the dead birds contaminated with the pesticide become another possible source of environmental hazard. Control of Quelea birds should thus be followed by collection and appropriate disposal of dead birds.



6.2. EHS CONSIDERATIONS DURING CONTROL

Management of Quelea birds must be carefully planned and executed to avoid or minimise impacts to the environment and human health. Where management practices involve use of pesticides the following considerations should be made:

1. Use pesticides (Avicides) that are registered by PCPB. List of registered pesticides / Avicides can be found on the link <https://www.pcpb.go.ke/list-of-registered-products/>
2. Ensure that control methods do not harm non-target species, including pets, wildlife, and beneficial insects.
3. Use methods that do not disrupt the local ecosystem balance. For example, avoid broad-spectrum products that can affect non-target organisms.
4. When using chemical pesticides, follow label instructions carefully to minimize exposure to humans and animals. Use personal protective equipment (PPE) and ensure proper ventilation.
5. Regularly monitor and evaluate the effectiveness of control measures to ensure they are achieving the desired outcomes without causing undue harm.
6. Ensure proper disposal of dead or trapped birds. Collection of trapped or dead birds should follow immediately after control exercise to avoid cross-contamination of non-target organisms or pollution

7. Establish the roosting sites and apply control at night during rest hours of the birds.
8. The spray equipment used is appropriately calibrated to ensure precision of spraying
9. Correct timing of sprays activities is done in order to properly target the pest , minimize chemical drifts, reduce volatilization of pesticide molecules as well as adherence to re-entry intervals to avoid exposure to non-target organisms

6.3. RECOMMENDED TYPES OF PROTECTIVE CLOTHING

There are three routes through which a pesticide can enter the human body including direct contact (skin and eyes), inhalation (nose and lungs), and by ingestion (mouth). In most pesticide handling situations, the skin is the part of the body that is most likely to receive exposure. Below are some of the recommended personal protective equipments that one can use while controlling the pest;

1. Coveralls

There are two types of coveralls: lightweight disposable coveralls made of chemical-proof material and washable cloth coveralls. This type of coverall is strongly recommended, made of waterproof and washable fabric and may be reused many times. Avoid cotton fabric clothes that may absorb liquid pesticides.

2. Gloves

The skin on your hands can absorb pesticides and their solvents. When working with liquid pesticides, protect your hands by wearing liquid-proof gloves.

3. Boots

Rubber boots are particularly important when mixing or loading pesticides.

4. Goggles

It is especially important to protect the eyes with chemical goggles when handling liquid, dust, wettable powders, or granules of pesticides.

5. Face shield

Effective face shields are made of clear plastic, attached to a hard hat, and can be raised or lowered as needed. Face shields must be washed with soap and water after each use.

6. Respirators

These are Devices designed to protect the respiratory (breathing) system are called respirators, and must be worn when working with pesticides that may be harmful when inhaled.





6.0 REFERENCES

CABI: Red-billed quelea damage to cereals, Digital library accessed on 12/12/2024.

Elliott CCH, 1979. The harvest time method as a means of avoiding quelea damage to irrigated rice in Chad/Cameroun. *Journal of Applied Ecology*, 16(1):23-35.

Elliott CCH, 1989. The pest status of the quelea. In: *Quelea quelea: Africa's Bird Pest* [ed. by Bruggers, R. \Elliott, C. C. H.]. Oxford, UK: Oxford University Press, 17-34.

Elliott CCH, Mtobesya BN, Cheke RA, 2013. Alternative approaches to Red-billed Quelea *Quelea quelea* management: mass-capture for food. *Ostrich*.

Erickson WA, 1989. *Quelea quelea*. *Africa's Bird Pest* [ed. by Bruggers, R. L. \Elliott, C. C. H.]. Oxford, UK: Oxford University Press, 230-247.

Grange MLa, 1989. Social behaviour and vegetation preferences of queleas during roosting. In: *Africa's feathered locust* [ed. by Mundy, P. J. \Jarvis, M. J. F.]. Harare, Zimbabwe: Baobab books, 104-110.

Jarvis MJF, Grange MLa, 1989. Conservation, quelea control and the trap roost concept. In: *Africa's feathered locust* [ed. by Mundy, P. J. \Jarvis, M. J. F.]. Harare, Zimbabwe: Baobab books, 130-136.

Jarvis MJF, Vernon CJ, 1989. Food and feeding habits of queleas in southern Africa. In: *Africa's feathered locust* [ed. by Mundy, P. J. \Jarvis, M. J. F.]. Harare, Zimbabwe: Baobab books, 24-35.

Manikowski S, Bortoli L, N'Diaye A, 1989. Distribution, populations, and migration patterns of quelea in western Africa. In: *Quelea quelea. Africa's Bird Pest* [ed. by Bruggers, R. L. \Elliott, C. C. H.]. Oxford, UK: Oxford University Press, 144-157.

McWilliam AN, Cheke RA, 2004. A review of the impacts of control operations against the red-billed quelea (*Quelea quelea*) on non-target organisms. *Environmental Conservation*, UK, 31(2):130-137.

Ward P, 1971. The migration patterns of *Quelea quelea* in Africa. *Ibis*, 113:275-297.







REPUBLIC OF KENYA

State Department for Agriculture
Plant Protection & Food Safety Directorate
NARL-Kabete, Waiyaki Way, Westlands
P.O. Box 14733 - 00800 Westlands
Email: ppfsd@kilimo.go.ke
Website: www.ppfsd.go.ke

