

# Package 102, Item 1

Type: Issue pack

November 2016

**Raising guinea fowl**

1. **Introduction and how to use this issue pack**

This issue pack is designed to give radio broadcasters the information needed to create effective and entertaining radio programs about raising guinea fowl.

It talks about raising guinea fowl in northern Ghana, but you can easily adapt the information here to other sub-Saharan African countries where guinea fowl are raised.

The issue pack begins with this introduction, then **Section 2** presents two true stories of raising guinea fowl in northern Ghana.

**Section 3** presents background information on the production part of the guinea fowl value chain. Please see Resource Pack 95, Item 9 – *An introduction to value chains* – for a definition of “value chain,” and for a better understanding of why value chains are important to both broadcasters and farmers.

Finally, in **section 4**, we list sources for further information on raising guinea fowl. We include resource organizations, online radio programs, online videos, and online documents.

You could use the information in this issue pack in several ways. For example:

* You could use the stories in section 2 as a starting point for creating your own local programming on raising guinea fowl. You could interview farmers who raise guinea fowl.
* You can use section 3 as background information for any program on raising guinea fowl.
* You could contact one or more of the organizations listed in section 4 for further information, or to interview experts.
* You could use the audio and video resources and online documents in section 4 to help you create programs on raising guinea fowl.
1. **Stories about raising guinea fowl**

**Guinea fowl story #1:**

**Appiealore Alagiwugah** lives in Banyono, in the Upper East Region of Ghana, and has been raising guinea fowl since 2008. He says that there are two big challenges to raising guinea fowl. The first is raising the keets (as the young birds are known) so that they survive. It’s not unusual for 500-600 of 1000 keets to die, and sometimes more.

The second challenge is marketing. Mr. Alagiwugah says that, in his area, if you want to sell your birds when they are six months old, there are no buyers who will purchase a large number of birds. So guinea fowl farmers sell the birds one at a time in the market.

Mr. Alagiwugah is the vice-chairman of a local guinea fowl farmers association. Through his association and from listening to his local radio station, he learned how to properly house the birds, keep them healthy, and feed them well. He discovered that keets must be kept warm, and has now constructed coops so the cold can’t get at them. Now he confines the keets for the first 4-5 weeks of their lives, and the survival rate is much better.

**Guinea fowl story #2:**

**Theodora Kubaje** grew up helping her father take care of guinea fowl, and then married a farmer who supports her to raise them. She has kept guinea fowls as an adult since 1972, and even earlier as a child.

She agrees that keet mortality is the main challenge. She learned through the radio that housing is vitally important to protect adult birds against predators such as hawks, and to protect eggs from thieves. Housing the birds also allows her to collect their eggs much more easily than when the birds lay eggs outside in the bush.

She built a roofed and plastered house to keep the birds healthy and safe. When she learned that keets don’t like too much moisture, she added sawdust to the floor to soak up the moisture. Her house is well-ventilated and she sometimes covers the ventilation holes with polythene to keep the house warm and prevent water from enter the housing and troubling the keets.

Mrs. Kubaje also belongs to the local guinea fowl growers association, and has spoken on the local radio station about raising guinea fowls.

1. **Background information on guinea fowl in Ghana**

Nine of ten households in northern Ghana raise guinea fowl and the birds play a significant role in the food security of these households. Village and suburban families typically raise five guinea fowl and one guinea cock. Poorer households sell their birds early (usually during festivities), but better-off households keep the birds until the end of the farming season in March, then harvest eggs until October or November, when they replace the birds with new stock.

Guinea fowl are productive and their meat is nutritious. They have a higher percentage of edible meat than chickens, and contain 23% protein compared to 21% for chickens The meat is low in cholesterol and the fat content is 4%, compared to 7% for chickens. Guinea fowl eggs have a thicker shell than hen’s eggs, are more resistant to shock, and can be kept longer and transported farther in good condition. There is a high demand for both meat and eggs. In most parts of northern Ghana, tradition allows both men and women to own guinea fowl. Note that two scripts in the current Resource Pack—items #2 and #3—address the issue of women raising guinea fowl.

During the June to August lean season, farmers in northern Ghana typically sell guinea fowl before other assets to meet immediate needs such as farm inputs or food. Families also use guinea fowl in funerals, courtships, sacrifices, and to settle disputes.

**The major challenges of raising guinea fowl**

Raising guinea fowl can be a profitable business, but farmers must know how to meet a number of challenges. These include:

* high keet mortality (young guinea fowl are known as “keets”)
* difficult and/or inaccurate methods of “sexing” (determining the sex of) keets
* low fertility and poor hatchability. Hatchability is defined as the percentage of eggs set to hatch that actually hatch.
* lack of reliable sources of good quality day-old keets (This is the most important barrier to commercial production of guinea fowl in northern Ghana.)
* not enough information about the nutritional needs of guinea fowl
* not enough quality feed in the dry months
* predation of birds and eggs by dogs, snakes and hawks
* poor health care for guinea fowl
* inadequate extension services, technical advice, and information on raising guinea fowl
* difficulty accessing credit to start new guinea fowl businesses or expand existing ones

**Three approaches to raising guinea fowl**

There are three types of production systems for guinea fowl:

* extensive or free-range
* semi-intensive
* intensive

Most small-scale farmers use the extensive or free-range system because it is the least costly method. Some use the semi-intensive system. This issue pack will focus on these two systems, and not on the intensive system used by larger, commercial farmers. For small-scale farmers, there are advantages and disadvantages to each system.

*Extensive production system*

In the extensive system, large flocks of birds roam freely over a large area of land. Birds forage for food and water in rangelands, in crop fields, and around houses. Farmers may provide some housing, or none at all, in which case birds sleep in trees near houses. Farmers provide minimal inputs and no medication, and production and profits are low. This system only works when there is enough land to support a large flock.

Advantages of extensive production:

* When there is enough land, birds can find enough to feed themselves.
* The meat is said to be tastier than under intensive care because of the variety of feeds.
* The need for initial capital and the cost of production is low.
* The birds have limited stress because free-range is similar to their natural condition. It allows them freedom of movement and natural behaviour.

Disadvantages of extensive production:

* Predators and thieves can steal eggs.
* Egg production is low, partly because farmers cannot reliably find and collect all eggs.
* There is high mortality from diseases, predation, pests, and, especially in the dry season, poor nutrition.
* It is difficult to tame birds, and they can be aggressive.

*Semi-intensive production system*

In semi-intensive systems, large flocks roam over a limited area, which is usually fenced. There is usually some housing within the fenced area to provide shelter at night and during the heat of the day. Birds eat fresh green forage in troughs and there is supplementary feed and water in troughs. Farmers usually supply birds with perches.

Advantages of semi-intensive production:

* Using fresh forage keeps the cost of feed low.
* Housing and fencing offer some protection from predators and theft.
* Birds are less stressed when they have a large area in which to forage.

Disadvantages of semi-intensive production:

* The cost of production is higher than free-range systems.
* It is difficult to tame birds, and they may act aggressively.

**Productivity**

The average fertility rate for guinea fowl eggs in Ghana is 65% (meaning that slightly more than six in 10 eggs are fertile), and the average hatchability rate is 60% (meaning that a similar proportion of eggs will hatch). Both fertility and hatchability are lower during the lean season. There is 40-100% mortality and the average weight at 24 weeks is 1.2 kg. Mortality is mainly from pneumonia and dehydration. During post-brooding, the main cause of death is worms. There are many deaths during the cold dry *harmattan* season, presumably from pneumonia.

In the wild, guinea fowl start producing eggs at 28-42 weeks old and lay 15-20 eggs per season. In captivity, they start producing at 28-32 weeks, and lay 50-100 eggs per year.

Productivity is poorer in free-range than in more intensive systems. This is likely because of inadequate feeding, poor health care, and poor general management. The high temperatures in northern Ghana also reduce productivity.

**Housing guinea fowl**

Good housing protects guinea fowl from diseases, predators, rain, sun, and cold and hot temperatures. Housing makes it easier for farmers to monitor, examine, feed and water, medicate, and slaughter birds. It also helps farmers manage reproduction, collect eggs, and collect manure to use as farm fertilizer.

In more intensive production, clean flooring may be covered with dry litter, or raised and made with wire mesh or slats. The wire mesh or slats allow manure to fall through to the ground, so birds are not infected with diseases or parasites through contact with manure.

*Types of housing*

*Cages for growers, breeders, and layers*:Cages for broilers (birds raised specifically for meat), growers (birds raised for breeding or for egg-laying), breeders (birds raised for breeding purposes), and layers (birds raised to lay eggs), can be made of wood, burglar-proof wire, or chicken wire.

*Brooding cages or brooding house:* The brooding period is the three-to-six-week period when hens are sitting on the eggs. Brooding cages for hot weather are built from chicken wire, wood, and roofing sheets.

Cages should be raised 20 centimetres above the ground. Feeders and drinkers—tin cans, earthenware pots, or metal and plastic containers—should be secured so birds do not overturn them. Lanterns or electric bulbs provide light and heat during the night. Brooding cages for cold weather include some areas that are completely enclosed.

*General recommendations for housing guinea fowl:*

1. Confining young guinea fowl in housing from day-old to six weeks old reduces mortality.
2. After 6 weeks of brooding, growers need separate housing.
3. Housing should be comfortable and make it easy for the farmer to feed and water the birds.
4. Avoid overcrowding by having no more than 5-6 keets per square metre (one arm stretch by one arm stretch).
5. Build housing in a shady or airy place. If this is not possible, plant trees around houses. The land should be high, free from waterlogging or easily drained.
6. Design open-sided buildings with an east-west orientation so the sun doesn’t directly enter the housing.
7. In semi-intensive systems, include a large yard for exercising, nesting, and grazing.

*Equipment for houses*

*Feeders* can be plastic, metal, or wooden. The most popular *drinker* is made from plastic. There should be one drinker for every 20-25 birds. Birds should also have *perches* once they are 8-10 weeks old. They use perches to sit, sleep or rest, just as they use trees or buildings in a free-range system.

**Feeding guinea fowl**

Free-range birds feed on rangelands and cropped fields during the day. Guinea fowl mostly feed around their nest. Laying hens visit their nests in the morning and evening to make sure their eggs are intact. The birds have a relatively low need for water, so this is not usually a problem, even in dry northern Ghana.

*Feeding in free-range systems*: Free-ranging birds feed on insects, worms, leaves, seeds, and household leftovers. Owners supplement this diet with whole grains (maize, millet, sorghum, and rice), agro-industrial by-products (rice bran, maize bran, pito mash, etc.), white ants, maggots, and termites. Farmers provide these supplementary foods in the morning and evening to help tame birds and get them to return to their housing.

Farmers normally feed the birds white ants, maggots, and termites from one day old to six weeks old during brooding. Farmers harvest white ants from their mounds, and get maggots from slaughterhouse areas.

To trap termites, farmers dig a hole in a termite mound, then mix cow dung, straw, and water in a pot, and place the pot upside down in the hole. They leave the pot for some hours or overnight, then harvest the trapped termites. Farmers can also bore a 10-15 centimetre diameter hole in the side of a termite mound, then fill the hole with a mixture of sand and leaves or shrubs and leave it for an hour or two. As termites enter the hole to feed, farmers can harvest them.

Guinea fowl should be allowed to drink at will. Their water requirements are 50-60 millilitres (about ¼ cup) per day for starters, 100-120 millilitres (about ½ cup) for growers, and 140-160 millilitres (about 2/3 cup) for finishers.

*Post-brooding feeding:* A wooden feeding trough one metre long (one arm stretch) will feed about 20 birds.Some farmers also use circular suspended feeders.

**Breeding guinea fowl**

There are two types of breeding: pure breeding and cross-breeding.

To breed good birds, farmers should select bigger eggs and heavier birds. These qualities pass easily from one generation to the next. And because one hen produces many keets, improvements can occur quickly.

*Pure breeding* involves mating individuals within the same species. There are two types of pure breeding: *outbreeding* or outcrossing, which breeds unrelated birds, and *inbreeding*, which breeds related birds.

The disadvantages of inbreeding include:

* reduced fertility
* reduced litter size
* reduced survival
* reduced capability of hens to mother keets
* reduced growth rate
* increase in genetic defects (for example, absence of limbs)
* reduced libido in males
* reduced resistance to disease

To avoid inbreeding, farmers must find eggs outside the farm.

It’s important to change or sell guinea cocks often so they don’t breed with their daughter, mothers, or sister.

*Crossbreeding* is mating different breeds, for example, mating helmeted guinea fowl with white-breasted guinea fowl.Crossbreeding improves performance, and can improve survival and reproduction very quickly. Crossbreeds typically have bigger eggs and larger bodies than purebreds.

*Buying new birds:* When farmers start keeping guinea fowl, they have two sources for birds: buying eggs for hatching and buying birds from recognized growers.There are currently no recognized guinea fowl breeders in Ghana, so all farmers are breeders and sell breeding stock. To avoid inbred birds or eggs, either inspect the records of farmers from whom you buy birds or buy from outside your community.

*Choosing replacement stock:*

1. Female replacements should not be related to breeding males.
2. There should be no abnormalities or deformities in the chosen birds.
3. Birds should meet farmers’ breeding objectives, for example, fast growth rate and high numbers of eggs.
4. To avoid inbreeding, breeding males should always be purchased from another farm.

**Incubation**

In free-range systems, guinea fowl start laying eggs between 28 and 32 weeks of age. Local birds can lay between 50-100 eggs per year while exotic breeds can produce about 200 eggs per year. Most guinea fowls lay between 9 a.m. and 2 p.m.

In free-range systems, guinea fowl often hide their eggs in the bush. To find out where a guinea hen’s nest is, confine the hens overnight until about 10:30 a.m. When they are released, they will run straight to their nest.

Free-range guinea hens can be trained to lay in a designated place if they are completely confined for two weeks, with feeding and watering. After this period, even when they are released to free-range, they will return to the designated area to lay. Guinea hens about to lay or after laying make a sound like “kien kien kien kien kien.”

To hatch eggs, farms should control heat, ventilation and humidity. Incubation is the process of sitting on eggs to hatch them. There are two types of incubation: natural and artificial incubation. Natural incubation is having a guinea hen or domestic fowl sit on and hatch the egg. Because guinea hens do not consistently care for their keets, local fowl hens are better than guinea fowl hens for brooding. Also, because local or domestic fowl always return to their pen and guinea fowl always follow their mother, this is an easy way to train keets.

Guinea fowl eggs take 24-28 days to hatch. The peak laying period is during the rainy season. Sometimes, guinea fowl and chicken eggs are mixed and chicks and keets are hatched together and raised by the hen.

In natural incubation, a young chicken, turkey or guinea hen can brood 8-12 eggs. Bigger, older hens can incubate 20-30 eggs with 80% hatchability. Farmers should keep brooding hens in a dark, isolated area with a nest of clean dry straw or grass. Four days after incubation, the nest should be sprayed with a safe and approved improved chemical to kill parasites such as lice, mites, fleas, and ticks. Hens should be regularly fed and watered close to the nest. During the dry period, water should be lightly sprinkled on the eggs.

Commercial farmers use artificial incubation with gas-, kerosene- or electrically-powered machines called incubators. This issue pack does not describe artificial incubation further.

**Managing birds for maximum hatchability**

Under natural mating conditions, the mating ratio is about two females to one male. If there are more than two females to one male, females may go unmated, causing lower rates of fertilization and lower hatchability.

*To ensure a high rate of hatching, farmers should use the following guidelines:*

1. Raise only as many birds as they can conveniently handle.
2. Feed and water birds adequately during breeding, providing enough vitamins, minerals, protein and carbohydrates (energy).
3. Cull birds over two years old, as their productivity and fertility decreases.
4. Leave one or two fresh eggs in the nest when collecting eggs to encourage the hens to continue laying in the nest.
5. To ensure maximum health and reduce stress, ensure that the laying nest has good shade and light. Hens should not be disturbed while laying eggs.

**Collecting, handling, and storing eggs**

With natural mating, farmers should collect eggs from June to September to coincide with the period of highest sperm production. The lean period of egg harvesting is from October to March. With local guinea fowls, fertility (the ability to hatch an egg into a keet) is about 42%.

*To ensure fertile eggs, farmers should follow these guidelines:*

1. Collect eggs once a day, preferably after 2 p.m. More frequent visits to the laying nest and disturbing birds during laying may scare guinea hens away.
2. From December to April, store eggs from day 1 of lay up to day 5. But in May to November, you can store eggs for 7 days.
3. Store eggs with the large end up.
4. Fertile eggs meant for hatching should not be stored for more than a week because fertility is reduced with storage time.
5. In the traditional system, eggs are stored in calabashes, gourds, or clay bowls in a cool place. Farmers can also store eggs in clean egg trays.
6. Ensure that all materials and equipment used for hatching eggs are clean and dry.
7. Gather eggs for hatching daily and store in a cool dry place (10-20 degrees C) with 60-70% relative humidity, but not in a fridge or freezer.
8. Only use clean, normal-sized eggs for hatching. (Oversized eggs may have double yolks which are not good for hatching.) Clean eggs are less likely to be infected.
9. Remove all cracked eggs before placing in the nest for hatching.
10. Always wash hands thoroughly with soap and water before and after handling eggs.
11. To transport hatching eggs within a 20-kilometre radius by car or motorcycle, line packing cases with soft material. Avoid vigorous shaking of eggs, as this will render them infertile.

**Brooding**

*Brooding* is caring for and managing keets soon after hatching until they are able to keep themselves warm without external sources of heat. During the natural brooding process, the mother provides warmth to the keets and protects them with her wings or body. With artificial brooding, warmth is provided by external sources of heat such as electricity, gas, or charcoal. (Note that, when hens sit on eggs to hatch them, this is also called *brooding*. But it is also called *incubation*, the term we use in this issue pack.)

*Natural brooding:* If farmers plan to use a hen to foster the keets, deworm the bird three to five days before hatching. In northern Ghana, brooding with a domestic fowl or guinea fowl is more successful in the warm dry period from September to April than in the cold, rainy months from June to August. Ideally, the brooding period should be 1-6 weeks long.

During brooding, place feed and water in troughs to prevent spillage, contamination, and drowning. Different types of cages are available to confine keets and mothers and protect them from rain, predators, accidents, and straying. Farmers should not mix keets of different ages in brooding to prevent harmful competition for water, food and warmth.

*General recommendations on brooding*

1. The guinea keet is fragile and nervous, and easily panics. Farmers must take care to avoid stress and suffocation.
2. Thoroughly clean a brooding house or coop an hour before keets arrive and provide clean water. Remove all old litter and carry it away from the surroundings. If the house was not used for a long period, whitewash the walls. Disinfect the house with a suitable chemical,
and disinfect feeders and waterers and dry them in the sun before putting them back in the house. Weed and clean the surroundings.
3. Install keet guards in brooding houses. These block corners and prevent keets from crowding or congregating there in case of panic.
4. If keets have travelled a long distance or show signs of fatigue, give them glucose in water.
5. Make sure that keets have easy access to food and water.
6. Immediately after brooding, clean and disinfect the brooder house before receiving new keets.
7. Workers must be clean and wear protective clothing.
8. Wash and sun-dry feeders and drinkers after brooding.
9. Change the litter at the end of the 4th week.
10. Dispose of dead birds properly by deep burying or burning.

*Medication during brooding:*

For best results, use the following routine:

1. Provide glucose and vitamin C on the first day after hatching.
2. Give antibiotics, minerals, and vitamins on days 2-6.
3. Give Gumboro vaccine in the 2nd week.
4. Give the first Newcastle disease vaccine (HB1) during the 3rd week.
5. Deworm in the 4th week.
6. Give fowl pox vaccine in the 5th week.
7. Give the 2nd Newcastle disease vaccine (Lasota) in the 7th week.
8. When keets/birds show signs of illness, administer antibiotics and a vitamin-mineral pre-mix for five days.

**Post-brooding management**

Post-brooding management (after brooding until slaughter or laying) is less demanding than brooding management.

 “Growers” can forage for themselves in free-range systems. Growers received in free-range systems should be confined for two weeks after arrival. During confinement, they are fed a balanced diet and adequately watered. After they are released, farmers should increase the frequency of supplementary feeding, and given vitamins and minerals at 8-10 weeks. At 14-15 weeks and every 2-3 months thereafter, they should be dewormed with a broad spectrum dewormer.

Growers often get enough food energy during harvest or at other times when grains are available, but not otherwise. During harvest, they may not get enough protein to grow or lay eggs, and may need supplementation with worms, termites, insects, maggots, soybean cake, fish meal, etc. In the dry season, farmers should add dried greens to avoid vitamin A deficiency.

*Watering:* Large (5-litre) plastic fountain waterers serve about 10 birds. Locally-made clay pots with openings can also be used, and are good for 5-6 birds.

*Important facts about post-brooding feeding:*

1. All birds must have access to food. Feed accounts for the largest percentage of the cost (60-70%) of raising guinea fowl.
2. Diets differ because the energy and nutrient requirements depend on the age and stage of growth and whether birds are keets, growers, layers, etc.
3. Feed should be balanced. Incomplete or unbalanced feed reduces performance and may cause nutritional diseases. Include a variety of ingredients in the feed to reduce the possibility of nutritional deficiencies.
4. Energy comes from carbohydrates, fats and oil.
5. Important vitamins are niacin, riboflavin, vitamin B12 and vitamin A.
6. Important minerals are calcium, phosphorus and salt.
7. Feed must have a pleasing taste to ensure that birds eat enough to meet production needs.
8. Smaller and younger birds require less feed to put on weight than larger and older birds.
9. The protein content in the diet should be higher for young guinea fowl. Guinea fowl approaching production (laying) are still growing and require more feed than mature hens.
10. To reduce waste, do not fill feeders to the brim. Ensure that feeders always contain food.
11. Commercial feeds which contain a variety of ingredients formulated by experts may be more profitable to feed to keets.
12. If you don’t have commercial feed, birds can be fed acceptable green feeds, some grains, and maggots or termites. You can tie plant materials in a bundle and hang in the cage for birds to eat.
13. A mix of sorghum or maize for energy and roasted whole soybeans for protein can give farmers an acceptable level of production. (Soybeans must be roasted to ensure good digestion.)
14. Water must be available at all times.

**Sexing of guinea fowl**

It is difficult to tell male and female birds apart in the first few months of life. But there are visible differences between the two sexes which observant farmers can use to tell them apart. For example, the narrow end of male eggs is more pointed than female eggs, which are slightly rounded.

**Managing health and disease**

Keet mortality is mainly because of inadequate or contaminated feeders or drinkers, heat and cold, inadequate space, worms, and accidents. Grower deaths occur from infections and parasitic worms. Diseases are spread through manure and body contact.

Birds are more resistant to disease when they are well-fed, protected, and healthy.

Farmers should be able to recognize the general symptoms of disease, including: coughing, sneezing, gasping, watery eyes, droopiness, bloody/watery/abnormal faeces, a sudden drop in feed and water consumption, and a decrease in egg laying.

The following table shows the main diseases and treatment.

|  |  |
| --- | --- |
| **Main diseases** | **Prevention and treatment** |
| Newcastle disease (viral) | Prevention through vaccinations three times a year and footbaths. Prevention of secondary bacterial infections with antibiotics. No specific treatment.  |
| Gumboro (viral) | Prevention through vaccination. No specific treatment, but vitamin and electrolyte therapy (to maintain an adequate balance of minerals in the blood) is helpful.  |
| Fowl pox (viral)  | Early vaccination twice a year. No treatment, but the disease is slow to spread, so vaccination may stop an outbreak.  |
| Marek’s disease (viral)  | Prevention through vaccination at hatchery. No treatment. |
| Coccidiosis (protozoan)  | Use coccidiostat for prevention and treatment. This is a veterinary drug which controls protozoa, and can be given in feed or water.  |
| Pullorum (bacterial)(Salmonellosis) | Prevention through good hygiene. Treatment with antibiotics and antibacterials will reduce mortality, but eradication requires destroying the entire flock.  |
| Fowl cholera (bacterial) | Prevention with vaccination (this is not done in Ghana). Treatment with sulpha drugs and antibiotics.  |
| Round and flat worms  | Prevention through appropriate deworming and good sanitation. Treatment with dewormers.  |
| Ectoparasities (mites, ticks, fleas and lice)  | Prevention through good sanitation. Treatment with chemicals which control mites and chemical dusts to control lice and fleas.  |

**Sanitation and hygiene for guinea fowl**

1. Isolate sick birds to prevent them from spreading diseases to other birds.
2. Keep birds brought from other farms apart for 4-5 weeks before allowing them to join other birds on the farm.
3. Keep wild birds and animals away from the farm. They frequently carry diseases.
4. Strictly control vehicles entering the farm. Ensure that any vehicles entering the farm enter through a dip. Provide footbaths. Farmers can use an old jute sack with the disinfectant at the entrance to the poultry house.
5. Do not allow manure, feathers and rubbish to accumulate. Burn or till into the land for fertilizer.
6. Clean and disinfect the area where birds are kept each season. Use disinfectants only after cleaning because dirt can neutralize their effects.
7. Place wire netting over windows and air inlets to prevent wild birds from entering the house.
8. **Further resources on the guinea fowl value chain in Ghana and sub-Saharan Africa**

***Resource organizations***

Here are some of the organizations that are involved with guinea fowl in Ghana:

1. Guinea Fowl Farmers Association (GUIFFA), Upper East Region. Phone: 0246067182
2. Participatory Action for Rural Development Alternatives (PARDA). Mr. Zimi Alhassan, phone: 0240399482, email: zimip554@gmail.com
3. Savannah Accelerated Development Authority (SADA). Mr. Abass Nyo, phone: 0244210420, email: nyoabass@yahoo.com
4. Trias Ghana. Rex Asanga, phone : 0208247156, email: rex.asanga@triasngo.be
5. Youth Harvest Foundation. Phone: 038-2023415, email: lariba.awimpang@harvestmail.org

 ***Documents***

* Guinea Fowl International website: <http://guineas.com/> A lot of useful information, some from Africa, some from elsewhere.
* J.C. Moreki, undated. *Guinea Fowl Production*. <http://www.gov.bw/Global/MOA/Guinea%20Fowl%20Production.pdf> (224 KB) – from Botswana.
* National University Extension and Research Liaison Services, Ahmadu Bello University, 2004. *The Production of Guinea Fowl in Nigeria*. <http://www.naerls.gov.ng/extmat/bulletins/Guineafowl.pdf>(999 KB)
* Animal Production Directorate, Ghana Ministry of Food and Agriculture, 2012. *The Training Manual for Guinea Fowl Production*.
* Zimmi, A. 2013. *Assessment of the potential of Agricultural Extension Delivery on Guinea Fowl Production by SS Farmers in the UER of Ghana*. Master’s thesis, University of Ghana. Downloadable at <http://ugspace.ug.edu.gh/handle/123456789/5449> (1,113 KB)

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