A study in South Africa of the efficacy of a commercially obtained thermostable Newcastle disease vaccine in village chickens when administered by different routes

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Abstract

Newcastle disease (ND) is a viral disease of poultry with a potentially devastating impact on both commercial and free-ranging poultry flocks. The disease is considered endemic in South Africa and vaccination is routinely practised in commercial poultry flocks. In village chickens, vaccination is not widely practised. There are several reasons for this, including difficulties in maintaining the cold chain and in the application of the vaccine to free-ranging birds.

The former problem has been partially overcome by the development of thermostable ND vaccines, most notably the I-2 vaccine developed in Australia. Because of stringent registration requirements, the vaccine is unavailable in South Africa. This study aimed to investigate the efficacy of a commercially available thermostable vaccine (Nobilis Inkhuku®) for use in rural communities in South Africa. In view of the difficulty of catching free-ranging chickens, three different vaccine application techniques were used: by eye-drop, in drinking water and in feed (maize).

Antibody titres measured on the haemagglutination inhibition (HI) test showed a small decline over 3 months after vaccination, indicating that an interval of more than 3 months between vaccinations would be appropriate for these flocks. Challenge studies showed an excellent correlation between HI titres obtained and survival after experimental challenge.

Titre group	Mean survival (%)
>3	95
1–3	47
0	23

Challenge survival rates varied between vaccine application groups and between the two study areas used. In both study areas, the overall survival rate for birds vaccinated by eye drop was slightly better than for birds receiving their vaccine via the drinking water. In the case of in-feed vaccination, the challenge survival rate was only slightly poorer than the other two routes in birds from the Northwest province, while birds vaccinated via feed in Qwaqwa showed a very poor survival rate. No unvaccinated birds survived challenge.

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Method of vaccine administration	Survival rate in Northwest province (%)	Survival rate in Qwaqwa (%)	Mean survival rate (%)
Water	86	60	73
Feed	75	10	43
Eye-drop	80	70	75
Controls	0	0	0

These preliminary results were considered most promising, especially the use of in-feed vaccination, which is simple to apply. Further work is planned to explore vaccine application techniques as well as the amount of effort rural communities are willing to put into the application of ND vaccine to their chickens.

Husbandry improvements and a training program for smallholder chicken producers

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Abstract

Newcastle disease research has shown that smallholder chicken production can be improved by saving the lives of many chickens. These additional chickens require improved care to ensure they perform well.

This paper has two parts, covering:

- techniques to improve the productivity of smallholder poultry
- short training programs about putting the techniques into practice.

Techniques

These aim to increase family food supply and income by improving genetic and environmental factors. Genetic improvement aims to use birds with higher genetic potential. Environmental improvement aims to protect birds from the elements, malnutrition and disease by providing better:

- housing
- nutrition
- vaccination
- sanitation
- husbandry
- marketing.

The husbandry techniques are identified in a table and described in narrative form. Numerous combinations of improved techniques are possible, and some preferred scenarios are suggested.

Training

Transferring the knowledge and implementing the skills can be done in a training program that sets out to:

- create awareness—why improve?
- improve production—teach skills
- spread the benefits—train others.

Introduction

Smallholder chickens are established in many cultures as a low-input, low-output part of subsistence agricultural activities. Constraints on productivity of these poultry activities have been identified, and methods of controlling the constraints have been studied.

There have been many attempts to improve chicken production in numerous developing countries and in the words of one aid project manager I met in Kenya, 'All poultry projects fail'. I have wondered why this attitude is held and, if it is true, why it must be so. It cannot be said that the Newcastle disease (ND) project for smallholder chickens has failed, but even it has had its problems. It is now recognised that maximum benefit from the project will be achieved if the increased numbers of smallholder chickens resulting from the use of ND vaccine can be protected against other threats to their survival.

Useful lessons can be learnt from the successful development of the high-technology commercial

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poultry industry and can be applied to the low-technology smallholder chicken sector.

There are cultural differences in attitudes to poultry care between people in developed and developing countries and the biases of each side in an aid project should be identified so that adjustments can be made.

People from developed countries often have a bias against housing chickens in cages and administering vaccines and medications to chickens. They may have a romantic picture of the happy barnyard with chickens feeding at the feet of the farmer's wife, laying eggs in a convenient location and producing baby chicks regularly.

Some people may also have negative attitudes towards larger-scale private enterprise and may consider that the involvement of commercial breeders, feedmills and equipment suppliers is somehow socially unhealthy. On the contrary, provided that there is some healthy competition, it is usual that such 'middle men' or specialist suppliers provide a worthwhile and economical service to producers.

Smallholders in developing countries may have a view that chickens are a low-cost (or no cost) part of the scene at home and that occasional eggs and chickens are a cheap addition to the diet. They may therefore be disinclined to spend money on improvements.

These attitudes encourage a view that smallholder chickens must operate on a low-input, low-output basis and can block a clear, objective consideration of ways to improve productivity.

Techniques

The categories of techniques to be considered are:

- planning
- genetic factors
- environmental factors.

Planning

Science and technology developed in commercial chicken production have some potential application in smallholder chicken production. Some choices must be made, and the planning phase is the time for this to be done.

Any smallholder chicken production project should have a planned approach to the endeavour. There are many options available, and some innovative thinking may be required to allow a response to the needs of the smallholder. An incremental approach may be best, to allow the advantages of each level of development to be tested, appreciated and applied step by step.

The starting point for an aid project may vary from a situation where no chicken production occurs, through a scavenging, semi-feral chicken situation to some more developed production situation, perhaps with some housing, some supplementary diet and maybe some vaccination.

I am assuming that the benefits of vaccination against ND have been accepted as a clear benefit but that the increased survival rate of vaccinated chickens has led to a need to develop ways to keep these survivors alive and productive. Scavenging chickens that have been protected against ND will soon overpopulate the available scavenging resource and will need additional husbandry inputs.

The planning phase must define the existing chicken production methods and consider whether it is appropriate to seek to develop a chicken project by means of adding technological elements so as to improve things in a sustainable way.

The planner must:

- describe the baseline poultry production situation and producer attitudes
- identify and quantify the marketing opportunities for selling products
- identify and quantify the inputs required to increase productivity of chickens
- select technological improvements appropriate to the circumstances
- train trainers and participants in the project
- prepare budgets for participants (and for the donors).

The details of each of these elements are too complex for this paper, but experienced aid planners will be familiar with the steps involved. The particular genetic and environmental factors available to the planner may, however, be unfamiliar.

Market demand

Planning such a project must begin with an estimation of the availability of a market for the product and of the ability of the project participants to supply the market. This may lead the planner to suggest development of a larger or smaller number of production units. At some point, a smallholder project may become a commercial operation and require a different level of planning.

Market supply

Having identified the market demand it is important to make sure that the project can expand or contract to meet that demand.

Economics

How many projects do you know that have been found to be uneconomical after trying to set them up? A simple budget may serve to encourage or discourage you at the beginning.

The budget process is based on reducing likelihood of success and failure. Table 1 outlines the fundamental elements of cost and income that should be taken into account.

An incremental approach is suggested. Start small and, as experience is acquired, some growth may be appropriate. While it appears sensible to apply the best level of environmental protection possible, there are some constraints that suggest a more cautious approach.

First, there are economic elements that need to be explored. A simple budget exercise may help identify how much investment will support a desirable return on investment but selling such an idea to a smallholder may be difficult. People seem to learn best by making mistakes. Remember that budgeting may convince you to not start at all. It is one of the prime benefits of a budget exercise to show that a proposal is unrealistic.

Second, there is limited experience in operating some of the elements of the system and research, perhaps operational research, may be needed.

Third, there is a concept of implementation by increments. As the benefits of each scenario are demonstrated, additional improvements can then be considered. A demonstration at the commencement of the project could be advisable.

Genetic factors

Consideration of introducing improved genetics should include different species and breeds. Layer or meat chickens, ducks (including some egg-laying varieties), guineafowl, muscovies, pheasants, partridges and quail may have some application in some areas. Species vary in susceptibility to diseases and in productivity and the need for resources (e.g. ducks eat invertebrates such as water snails). Local cultural attitudes also vary.

This paper concentrates on laying-hen production, as it is the most commonly practised form of poultry production and offers the most direct means to improve output efficiently.

Chicken meat production is a rather specialised activity and appears to me to be inappropriate for smallholder production activities.

In planning a layer-chicken project, consideration may be given to the choice of various genetic materials including:

- using unselected local breeds
- using improved local breeds
- upgrading with purebred males
- upgrading with purebred males and females
- using improved crossbreds.

Improved genotypes do not perform well under scavenging (semi-feral) conditions but if provided with some critical environmental protection they can perform better than local, unimproved birds. There are sometimes perceived cultural preferences for ‘local’ breeds and their products, but a little budgeting will soon show that the potential for improved productivity (dollar return on dollar invested) is low with poor-producing local breeds.

Improved crossbreeds may not perform well under environmental conditions prevailing in a particular locality but their greater genetic potential means that improvements in environment will permit them to express that potential. Local breeds remain limited in genetic potential and cannot be expected to respond significantly to improved environmental conditions.

Local breeds may, under conditions of good husbandry, lay 50 eggs per year, while improved commercial crossbred birds can lay over 300 eggs per year. Unimproved breeds are prone to broodiness. Broody hens lay eggs in a clutch (or batch) and then go into a pause when they do not lay. This is a natural arrangement to allow the hen to sit on her eggs to incubate and hatch them. Improved breeds are selected to have no broodiness and thus can lay more eggs per year.

In order to obtain improved genetic material, a source must be identified. As with most things in life, you get what you pay for. Commercial crossbred chickens have the best genetic potential and are expensive. Also, they need to be replaced each year or two as they are unsuitable for breeding future replacements. However, provided improved environmental conditions are provided, they can produce the best returns on investment.

Table 1. Budgeting for a layer chicken project: outline of items

INPUTS	Quantity	Cost	Total	**OUTPUTS**	Quantity	Value	Total
Capital							
Housing							
Fence							
Shelter							
Cage							
Equipment							
Feeder							
Nest							
Waterer							
Lights							
Egg flats							
Finance							
TOTAL							
Annual (recurring)							
Feed				Eggs			
Chickens				Culled chickens			
Medication				Manure			
Vaccine							
Repayments[a]							
Capital							
Interest							
Transport							
Specialists							
Vaccinator							
Beak trimmer							
TOTAL							
Intangibles							
Family labour?				Insect control?			
Land rental?				Cultural benefits?			

[a] Allow three years to recover the capital costs

A step-by-step process may be appropriate to allow the benefits of better genetics to become apparent to producers but a project that includes a demonstration of a few scenarios would soon show which genetic system provides the best outcome.

Environmental factors

Smallholder poultry of any genetic origin benefit from being protected from the ravages of the environment. They can be protected from the following environmental stresses:

- competition for resources (feed, space, perches, nesting sites) from other people's poultry, wild birds and animals
- atmospheric (meteorological) conditions
  - climate (the broader aspect of meteorological conditions temperature, moisture, wind velocity and barometric pressure) that prevails in a region
  - weather (the current state of the atmosphere)
- predators—human, animal, bird
- diseases
- malnutrition—insufficient or poor-quality feed ingredients and drinking water.

Good husbandry techniques can protect against all of these by providing isolation, confinement, housing, vaccination, medication, sanitation and nutrition.

There are degrees of each of these husbandry components and major planning and training objectives should identify the optimum component for any particular situation.

Isolation

Keeping susceptible birds separated from infected birds is a basic principle of disease control. The role of smallholder chickens in the spread of highly pathogenic avian influenza in the current outbreak in Asia is an important reminder of the importance of isolation. Very recently, the Netherlands government has banned the free-range system of farming due to concerns about the spread of avian influenza by migrating wild birds and now requires that all poultry be confined to secure housing.

All-in, all-out, single-age units have been adopted by the commercial industry but only after many years of sad experience with the alternative systems. Looking at scavenging chickens in a village situation may suggest that isolation is not possible but the emergence of avian influenza emphasises the need to be creative about ways of achieving adequate isolation. The cage system described below provides a way.

There is a great temptation to avoid single-age situations because, on the surface, continuous production from mixed age groups appears to be more economical. The single-age approach requires breaks in production, with consequent breaks in income. The advantage of disease control outweighs these costs. This fact may be the most difficult point to prove to sceptical smallholders.

Confinement—housing

Confinement may vary from providing a few perches near the home, through simple overnight shelter, provision of a fenced area, moveable sheds, semi-intensive housing (shed and fence), intensive shed, to raised floors (colony cages or laying batteries).

There are many documented forms of chicken shed for small flocks but I wish to mention a variation that I have seen in operation in Solomon Islands and which is a possible solution to this problem. This colony cage system seems to have particular application for smallholder chicken projects.

Most scavenging flocks are quite small and poorly producing so I believe a small flock of good producers will supply more eggs and offer a real increase in family income as well as supplying additional food for the family.

The critical technological elements of this type of unit is that it provides confinement, bird-proofing, a raised floor and isolation. If a flock of seven hens is placed in the cage and all are replaced at the same time a year or two later there is a very effective micro-production unit combining most of the lessons learnt by the commercial industry with the special needs of the smallholder.

Seven hens with the genetic ability to lay 300 eggs a year may lay less in a smallholder situation; allowing, say, 275 eggs per year means that there should be 4–5 eggs each day.

As a smallholder gains confidence in this system, it is possible to increase the output by adding cage units in stepwise fashion and to produce enough eggs for sale.

When operated on an all-in, all-out, single-age basis, this system avoids the use of live-bird markets, as the spent hens can be slaughtered for home consumption and new birds can be purchased

from a specialist breeder who practises various disease-prevention methods.

Toxins in the environment can be kept out of the chickens and their products when birds are securely housed, preferably on a raised floor.

Scavenging hens may lay eggs in hidden places that are hard to find, resulting in shortages and old (stale or rotten) eggs being discovered from time to time. Confined hens lay where the eggs can be found and thus bad eggs are not a problem.

Egg thieves—crows, snakes, lizards, mammals, people—may also be a problem with scavenging hens.

The colony cage

A small flock of laying hens can be housed in a colony cage consisting of a cube made from six panels, each 1 m square, secured together into a cube of 1 cubic metre. The colony cage is supported on legs of 2 m length in such a way that the floor of the cube is raised to a height of 1 metre above the ground.

The cage can have sides, floor and top clad with 12 mm netting. I have seen variations with wooden or bamboo slats set 12 mm apart. The unit needs an access door, a feed container, a water container, a nest and three perches. It should be placed in a shady spot to protect the chickens from direct sunlight.

Figure 1 gives an outline of a panel used in constructing a colony cage. Figure 2 gives an outline of a colony cage and a shelter shed.

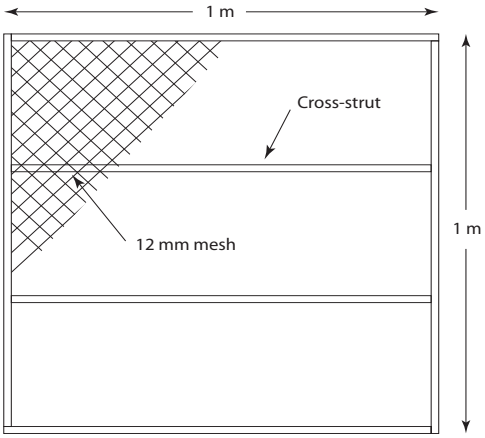
Flock size

The cage will hold seven hens comfortably. While more hens could be held in a larger cage there is no advantage in increasing the height. It can also be difficult to catch hens in a larger cage. Additional hens can be placed in additional cages that can be located nearby provided they all have the same health status.

Placement of cage

The cage must be sheltered from severe weather. A thatched shelter will usually be sufficient to exclude rain and strong sunshine. The setting sun must be kept off the shed, so some shade on the western side is needed. Shelter from the wind may be needed in some locations. Where theft is expected to be a problem, some thought should be given to security when deciding on the placement of cages.

Cages with birds of the same age and same disease status may be housed close together but 25 m separation is suggested for cages with birds of the same disease status but different age. Cages with birds of different disease status should be more widely separated, with minimum contact between them, and should preferably be separated by buildings or trees that act as a windbreak.



- The roof, floor and four sides are made from six panels, each 1 m (3 feet 4 inches) square.
- 12 mm (0.5 inch) mesh covering each panel.
- Wire on inside of cage for floor.
- Wire on outside for sides and roof.
- Two cross-struts on each panel.
- One panel to have a door inserted in lower third of panel.
- Top covered to prevent wild birds' droppings from entering.
- Western side shaded from setting sun.

Figure 1. Panel for colony cage cube

Raised floor

The raised floor separates the birds from their droppings, and breaks the cycle of infection by many organisms including coccidia and worms. It also allows ease of collection of the manure for sale or use on the garden. To prevent flies breeding in the manure, it should be removed weekly.

Single-age, all-in, all-out system

The best use of the colony cage is to place adult hens for the duration of their laying cycle and then replace them all after a thorough clean-out of the cage. Cage cleaning involves removing all obvious dirt and manure while it is still dry and then

thoroughly washing and drying everything, including equipment, with clean water two or three times. Use of disinfectants and detergents is expensive and, while useful, it is not essential in this system.

Choice of hens

Local breeds that are adapted to the scavenging life may be uneconomical in a colony cage. A higher, more predictable egg production is needed. Adult hens should be placed in the cage. The rearing of chicks is best performed at some distant location. If commercial hens are locally available they will have the best genetic potential**.** Point-of-lay or spent hens may be used. Spent hens are those that are at the end of their first year of commercial production. If available, they may be suitable for smallholder production, as they are less expensive than point-of-lay hens and will lay about 60% of the number of eggs expected in their first year. These commercial hens should have already received all the necessary vaccinations.

Egg production and collection

Housed hens will not hide their eggs so freshness is assured. Scavenging hens lay irregularly and will go broody and sit on clutches of eggs. Their eggs may be hidden and the age of the eggs is not known with possible rotten eggs being found. Commercial breeds do not go broody.

Breeding

Breeding, as with chick rearing, is best done elsewhere. No males are needed in the cage unless it is intended to breed.

Nest

The nest may be a simple box or a plastic drum cut to suit. It should be suspended above the floor so there is more floor space for the hens. A layer of dried grass should be placed in the nest and replaced weekly.

Feeders

Feeders may be of various types but should be half-filled and suspended at a hen's shoulder height so spillage of feed is reduced. Provision of feed at all times (ad libitum) is preferred if spillage is controlled. Periodic feeding leads to rushing at feeders with likely spillage.

Drinkers

Water should be available at all times. Many types of drinker are available but should be suspended at shoulder height to minimise spillage and contamination by droppings. Water must be from a clean source to eliminate the possibility of contamination by disease-causing organisms from wild or feral birds. This is particularly significant in relation to avian influenza where the virus is carried by wild waterfowl to lakes and ponds.

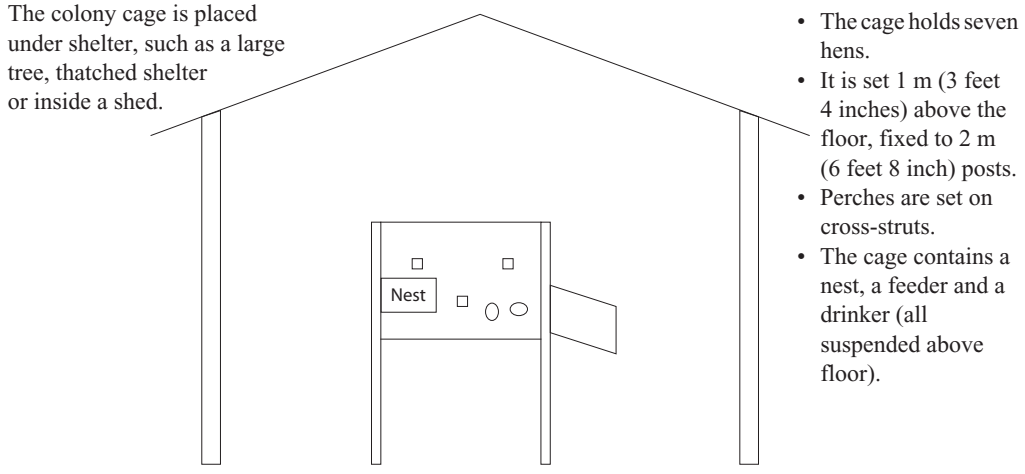


Figure 2. Colony cage

Materials

The materials used in construction may be any appropriate, locally available materials such as timber or bamboo but, for adequate ventilation, wire mesh must be used on the panels. The panels may be fastened to one another and to the support poles with nails, screws or tie-wire. Support poles should be 2 m long and placed so that the cage is 1 m above the ground.

Perches

Perches should be made from 50 mm × 25 mm (2 inches × 1 inch) timber struts and supported on the cross-struts of the side panels. One is suspended 30 cm (1 foot) high and two at 60 cm (2 feet) high.

Extra care

The temperament of the breed of hen must be evaluated, as cannibalism can be a problem in caged birds. If hens have not been beak trimmed before purchase they should be trimmed on arrival. The length of the toenails should also be watched and trimming may be needed.

The optimal temperature for laying chickens is between 21 ˚ and 28 ˚C. Outside this range, the efficiency of feed conversion falls off. At lower temperatures, birds use the feed consumed to maintain their body heat. At higher temperatures they have a lower appetite and cannot eat enough to keep up production.

In hot climates, the provision of some artificial lighting after dark when the air temperature has dropped allows birds to consume more feed and keep up production.

Egg production is seasonal in chickens and is dependent upon the relative length of light and dark. The period of low production occurs in mid winter. A lighting program to achieve 16 hours of light a day is effective in preventing the deleterious effect of changes in day length on egg production. This factor is important in areas distant from the equator but is less important near the equator where day length differs less.

Vaccination

The major lesson learned from the Australian Centre for International Agricultural Research ND projects is that protecting smallholder chickens from ND can increase their survival rate.

There are a number of other diseases (see Table 2) that can be prevented by vaccination. A survey of existing disease problems will indicate what vaccines are needed.

While it is always best to use vaccines prepared under strict conditions of hygiene and quality control, it is possible to use very basic vaccines for control of some diseases. Even in some quite advanced poultry industries, vaccines against fowl pox and laryngotracheitis have been prepared from infected birds.

Vaccine can be prepared by removing scabs from active fowl-pox lesions on the comb of infected birds. The scabs are ground in a mortar and pestle together with some sterile fine sand and mixed with glycerine (10 mL per scab) containing some antibiotics (penicillin and streptomycin). After settling for a few minutes, the supernatant is poured off and stored frozen. The scabs can also be air-dried and stored frozen in a dry form for many months without much loss of potency. The vaccine is applied by the skin stab method to the wing web or to the unfeathered skin of the thigh. If the vaccination has been effective, pox lesions will be evident at the vaccination site after 10 days.

Laryngotracheitis vaccine can be made from the tracheal exudate of recently infected birds. Six-week-old birds are reared in a good degree of isolation and infected by instilling a drop of infected tracheal mucus (mixed with antibiotic) into their trachea. After 3–4 days, some tracheal mucus has formed and can be collected by killing the birds, removing the trachea and slicing it lengthwise to expose the lumen. Scrape the mucus away from the lining with a scalpel blade. Mix the mucus with glycerine (10 mL per trachea) and antibiotics (penicillin and streptomycin) and store frozen. The vaccine is applied to the cloacal mucous membrane using a simple instrument consisting of a 2 mm piece of wire that is dipped into the vaccine and then rubbed gently onto the dorsal surface of the cloaca. If, after 4 days, the area of application has become inflamed with a characteristic cherry-red colour, this indicates that the vaccine has been effective.

Medication

As shown in Table 2, some diseases may require medication. The specifics of each medicine are too specialised for this paper. I have a warning about home remedies and so-called ethno-veterinary medicines. As with human ‘alternative’ remedies, there may be a gap between claims and reality. I trust

that Western middle-class sympathies will always take second place to the need for evidence that claims of effectiveness are true. Seek proof before accepting any claims.

Sanitation—hygiene

Some bacterial diseases may remain in the cage and equipment between batches and thus it is important to thoroughly clean everything before new birds are introduced. The hygiene process has several important steps. First, brush off any dirt, dust and droppings from housing and equipment. Then wash in warm water and detergent three times, allowing the things to dry between each wash. Finally, apply a strong solution of disinfectant foam and leave to dry. Protect from contamination by wild animals and birds until the new batch of chickens arrives.

Nutrition

Scavenging birds have a stocking density related to the available scavenging resource within the area of their home range. The resource can be extended by supplementary feeding that may range from table scraps and surplus or damaged grains from harvest time, through supplementary feeds such as grains or protein supplements, to full commercial feed.

It may be possible to prepare adequate feed from local ingredients but some expert advice is needed before doing so. Commercial feed may be in mash or pelleted form. The latter is slightly more efficient as each bird gets a balanced ration in each pellet. Mash feeds are a little less expensive and are quite usually satisfactory for layers. Free-choice feeding is worth considering also. In this system, the hens select their own mixture of ingredients. Separate feed containers contain grain and a concentrate comprising all the other ingredients of a full ration. The chickens select the ingredients required by them for different parts of their egg laying cycle.

When birds are held in a scavenging situation there can be some advantage in ensuring that young birds have access to improved feed by supplying it in a ‘creep’. This is a system in which feed is supplied inside a small barrier with spaces small enough to allow chicks to enter but not adults.

Although many feel intermittent feeding is more economical, there is plenty of evidence that the best system is to allow feed to be available at all times. Caged birds should have access to feed (and water) at all times.

The source of water is important. Water quality should be high enough to ensure it is free from contaminants such as toxins and microbes. Avian influenza especially is transmitted in water contaminated by infected wild birds.

A correctly balanced commercial ration should have sufficient calcium in it to prevent deficiency from occurring and thus provision of an additional source of calcium, such as shell grit, should not be

Table 2. Disease control in smallholder chickens

Disease	Prevention	Treatment
Newcastle disease	Isolate, vaccinate	
Fowl pox	Vaccinate	
Infectious bronchitis	Vaccinate	
Laryngotracheitis	Vaccinate	
Avian influenza	Isolate, vaccinate	
Infectious bursal disease	Vaccinate	
Marek’s disease	Vaccinate at 1 day of age	
Mycoplasma	Buy from tested breeders, isolate, vaccinate	Medicate
Pullorum disease	Buy from tested breeders, isolate, raised floor	Medicate
Fowl typhoid	Isolate, hygiene	Medicate
Fowl cholera	Isolate, hygiene, vaccinate	Medicate
Coryza	Isolate, vaccinate	Medicate
Coccidiosis	Medicate, raised floor	Medicate
Borreliosis (fowl tick fever)	Isolate, vaccinate	Medicate
Mites	Isolate	Medicate
Lice	Isolate	Medicate
Worms	Raised floor	Medicate
Toxins	Confinement	

needed. Chickens often eat small particles of gravel or grit, apparently to assist in grinding food in the gizzard. This is not an essential function but many producers feel that supplying shell grit adds a bit of calcium to the diet and provides something in the way of grinding material in the gizzard.

Extra husbandry

Closely confined chickens are likely to pick at one another and this can lead to severe damage, usually called cannibalism. Commercial industry may control it by lowering light intensity in windowless houses but most commonly by beak trimming. There are a number of methods of beak trimming but each consists of removing the first one-third of the top, and sometimes both, beaks. Bleeding is controlled by heat cauterising the cut surface. I have seen beak trimming done in Kenya by use of a large soldering iron which combined both cutting and cauterising.

Despite views to the contrary, male chickens (cockerels) are not needed for egg production but are needed for breeding. Cannibalism is likely to be less of a problem in chickens kept in confinement if there is no male bird present.

Specialised chicken breeders usually supply commercial farmers but are, of course, happy to sell chicks to anybody. There may sometimes be a need for specialised hatcheries to hatch eggs but this function is usually carried out by the breeder organisation.

There is an advantage in buying started (or ready-to-lay) birds. These are 16–18-week-old birds that have been reared in isolation and are free from specified diseases. The advantage of the purchase of started layer chickens is that someone else has borne the cost and time of rearing, vaccinating and medicating during the 5-month rearing phase. The buyer can get just the required number of birds without providing for the normal mortalities during the rearing phase and without having facilities and resources tied up during the long rearing period.

Natural incubation can be used by the less-developed smallholder using local or purebred chickens. The special crossbred birds do not go broody and thus are not useful for natural incubation.

If a hen does go broody it can be stopped in a number of ways, including confining it in a small cage with a wire or slatted floor and no nest. The hen cannot produce a warm environment for sitting on eggs and returns to normal in a few days.

Budgeting

Table 1 outlines the expense and income items likely to be involved for a single producer in a layer chicken project.

Disease control

Table 2 lists common diseases likely to occur in smallholder poultry and the principles of control for each disease. The details cannot be dealt with in this paper.

Incremental planning

Table 3 gives the various steps in developing the elements of layer chicken production.

Training

Transferring the knowledge and implementing the skills can be done in a training program that sets out to:

- create awareness—why improve on a traditional system?
- show how to improve production—teach skills to smallholders
- show how to spread the benefits—train the trainers.

Skills analysis

This process is an effort to identify and describe the skills needed to implement the program. It is conducted by drawing up a list of the component parts or steps for each of the essential skills, confirming their relevance by consulting stakeholders and having these findings validated by experts.

For example, the steps involved in achieving competence in the skill of beak trimming are as follows:

1. explain why beak trimming is done
2. explain correct age of bird for beak trimming
3. demonstrate location of cut for beak trimming
4. explain how long cautery is to be applied
5. prepare equipment
6. catch and handle bird
7. hold bird for the procedure
8. trim beak
9. apply cautery
10. check that job is done.

Table 3. Incremental change in factors involved in smallholder chicken production

Element	Base line (entry level[a])	Level 1	Level 2	Level 3	Level 4
MARKET DEMAND	Nil	Local	District	Agent	Integrated
MARKET SUPPLY	Feeding family	Sale of surplus eggs, chickens, manure	Increased production	Higher output	Commercial scale
ECONOMICS	Low input/low output	Small investment/return	Larger investment/return	Business level of investment/return	Expansion
GENETIC	Local breeds	Improved local breeds	Purebreed males	Purebreed both sexes	Improved crossbreeds
ENVIRONMENT					
• Nutrition	Base (scavenging + scraps)	Base + grains Creep feed	Base + grains + protein Creep feed	Balanced ration Choice feed	Ad libitum feeding—mash or pellets
• Water supply	Unsupervised	Shared with other stock and wild birds	Local storage	'Clean' source	Uncontaminated or treated
• Protection—housing	Free range	Fenced area	Semi-intensive Some egress from house	Intensive Closed shed No access to outside Bird-proofed	Raised floor
• Health	Nil	Newcastle disease vaccine	Sanitation	Medicines and other vaccines	Isolation
• Stocking density	Uncontrolled	Thinned periodically	Annual cull	Set flock size	
Additional husbandry					
• Age of replacement	Uncontrolled	Culled for age	Two years	Forced moulting	Annual
• Lighting program	Nil	16 hours per day	16 hours per day	16 hours per day	16 hours per day
• Husbandry specialisation	Generalists	Started layer rearing Vaccinators	Breeders Chick sexers	Hatchery Beak trimmers	Integrated
• Beak trimming	Nil	10 days of age	18 weeks of age	Two trims	Two trims
• Cockerels	Uncontrolled	Keep 'better' males	New male annually	No males	No males

[a] 'Level' refers to progressive steps within each row. In a particular case, elements from one level may be combined with elements from a different level. For example, raised floor house (level 4) could be combined with improved local breeds (level 2) and a lower level of health provision (level 1).

In a smallholder situation, it is possible that most existing participants may be skilled in steps 6 and 7 but would not be competent in any of the others. This knowledge would enable the training planner to give emphasis to the other items.

This list is also used to assess a student's knowledge and ability. Table 4 is an example of the checklist to be used for this example.

Other skills required may include:

- preparing a budget
- estimating market demand for eggs
- explaining the needs of hens for protection from the weather
- applying for micro-credit
- constructing a colony cage
- placing an order for supply of point-of-lay hens
- buying
  - feed
  - vaccine
  - medicine
- vaccinating against
  - Newcastle disease
  - fowl pox
  - laryngotracheitis
- collecting and storing eggs
- killing sick birds
- killing and dressing culled-for-age hens
- cleaning a cage between batches.

It must also be understood how to progress from a simpler to a more complex system, the reasons for isolation of laying hens from other birds and why live-bird markets are dangerous for flock health.

Gap identification

The difference between the skills required and the trainees' skills is the training gap that must be filled by the program. For each area of skill, a list of component parts or steps must be drawn up.

Curriculum

A training curriculum should be designed to address the skills gap. Some training may be done in groups but some may need to be done on individual properties.

The methods should be appropriate to the particular skills and include the following elements:

Literature

This should be prepared in appropriate languages and include relevant illustrations.

Lectures

These may be simple but should involve the participant directly in the activity as much as possible. 'Chalk and talk' is an inappropriate teaching method. Participatory learning is preferred.

Exercises

Practical measures to enable participants to be directly involved in explanations and practice are needed.

Demonstrations

These are essential to the training process and may include:

- infrastructure
- technology
- operations.

Table 4. Beak trimming—list of steps and assessment of competence

Date..... **Candidate**.....**Assessor**.....

No.	Step	Y or N	Comment
1	Explain why beak trimming is done		
2	Explain correct age of bird for beak trimming		
3	Show location of cut for beak trimming		
4	Explain how long cautery is to be applied		
5	Prepare equipment		
6	Catch and handle bird		
7	Trim beak		
8	Apply cautery		
9	Check that job is done		
10	Explain how long the effect will last		

During the training sessions, it should be possible to identify participants with leadership potential and those with the ability to become trainers of future participants.

The whole enterprise must be subject to regular monitoring in order to identify problems and thus suggest needs for research or for changes to infrastructure.

Conclusion

To maximise the proven benefits flowing from ND vaccination of smallholder chickens, it is necessary to improve their situation by offering them protection from other diseases, the environment, competitors and predators. Providing the chickens with confinement, improved nutrition and adequate housing can do this.

It is possible to move from a scavenging smallholder chicken operation by adopting the principles of good poultry husbandry as applied in the commercial chicken industry. An incremental approach is proposed, with the use of an isolated colony cage system being the optimal system.

Operational and other research projects will be needed to adapt the recommended approach to situations existing in various geographical and cultural situations.

Tools for effective dialogue with smallholder farmers in Togo

Charles E. Bebay[1]

Abstract

Crop and livestock production is the mainstay of 70% of the population of Togo, and traditional poultry production is a big part of this. Poultry—in order of importance, chickens, guineafowl and ducks—number about 7 million. More than 70% of Togolese farmers have birds. The main diseases affecting poultry are Newcastle disease (ND), fowl pox, Gumboro disease and parasitism. A system of community livestock workers and associated community drugstores introduced to combat ND failed. Details of the system are given and reasons for its failure suggested. Local radio was found to be an effective way to disseminate information about better practices for village poultry raising and could be a useful tool to improve farmers' marketing practices. Poultry development had a variable effect of the role of women in village chicken production; in some places enhancing it, in others the opposite. Marketing remains a weak link in efforts to improve smallholder poultry production and its contribution to food security, nutrition and poverty reduction in Togo.

Background

Togo is a West African country with a land area of 56,000 km^2. It is bordered in the north by Burkina Faso, in the east by Benin, in the west by Ghana and in the south by the Atlantic Ocean (Figure 1). The country is usually divided into five regions, which are, from north to south (cities are in brackets): Savanes (Dapaong), Kara (Kara), Centrale (Sokodé), Plateaux (Atakpamé) and Maritime (Lomé, the capital).

The Togolese population is estimated at 5 million and its annual growth rate is 2.3%. The country is one of the poorest in the world, ranked 141st by the United Nations Development Programme (UNCP) in 2002. According to the UNDP, 72% of Togolese are poor and 57% of them are very poor. The urban population doubled during the past 25 years.

The average annual economic growth rate was 1.2% during the past 6 years. This severely degraded macro-economic circumstance has been coupled with political instability since the 1990s. Women, children and disabled people are the most affected and penalised.

Crop and livestock sectors in Togo

Climatic conditions are suitable for a large range of tropical crop production in Togo. The rainfall situation is potentially very good for agricultural and livestock activities. The yearly average has been 1,100 mm during the past 25 years.

The main crop products are:

- cotton and coffee for export
- maize, rice, sorghum, yams, cassava, peanuts and beans as food crops.

Crop and livestock production is the mainstay of 70% of the population. The last agricultural census, carried out in 1996 with Food and Agriculture Organization of the United Nations support, reported that:

- only 25% of farmers are contacted by extension agents
- fewer than 3% of them used improved seed

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- 86% of agricultural areas are farmed using traditional means
- only 13% of rural households usually have access to credit.

Most of farmers are smallholders with less than 1 hectare of farmed land. Soils are being ruined because of intensive husbandry, principally in cotton-production areas.

Agricultural production contributes 40% of Togo's gross domestic product (GDP). The growth rate in food-crop production fell from 4.8% in 1985 to 1.2% in 2003, and investment in the rural sector as a whole fell over the past decade—from FCPA11 billion[2] in 1990 to FCPA2 billion in 2003 (World Bank 2003).

Cotton is the primary export crop and represents the country's second-highest export income earner (20%) after cement. Despite improved organisation, export crops produce only 10% of agricultural GDP, whereas livestock produces 14%. Cotton, cocoa and coffee production are falling.

Donors have strongly reduced their contribution in the rural sector. International cooperative relations are still led by the European Union (EU), despite its opposition to Togo's non-democratic political system.

Figure 1. Outline map of Togo and adjacent countries of West Africa

Livestock

Generally speaking, Togo is not a country with a strong commercial livestock production sector. Livestock production is conducted by smallholders, usually at subsistence level. Some details of the livestock sector follow.

- There is a modest cattle population of 200,000–300,000 animals. Tropical diseases like rinderpest, trypanosomiasis, anthrax and tick-borne afflictions are the main constraints. There is no extension program to develop meat or milk production. Only the EU finances a disease control project (focusing especially on transboundary diseases).
- The sheep and goat population is approximately 200,000. Its circumstances are similar to those affecting cattle.
- The pig herd has fallen significantly since 1997 because of African swine fever (ASF). There are now fewer than 100,000 animals compared with 500,000 before arrival of the disease. There is no national plan to eradicate ASF and it has spread all over the country. Pigs are traditionally raised by women, whose socioeconomic situation has deteriorated sharply since 1997.

Traditional poultry production is age-old in Togo. Poultry—in order of importance, chickens, guinea-fowl and ducks—number about 7 million. More than 70% of Togolese farmers have birds. The main diseases are Newcastle disease (ND), fowl pox, Gumboro disease and parasitism.

[2] FCFA = Franc Communauté Financière Africaine; 1 € = c. 666,000 FCFA

National production of livestock covers 60% of the country's requirement. The balance is provided by importation from Europe (chicken meat) and live cattle from Burkina Faso and Niger. European chicken meat is very competitive because it is mostly sold packaged while local production (commercial or traditional) is sold as live birds.

Livestock production is mentioned frequently in official documents. MOA (2004) specifies that actions in support of livestock development should aim at chickens, small ruminants and pig production for poverty alleviation and food security.

Chicken livestock system

The traditional poultry sector consists of free-ranging birds and makes up 90% of the national chicken flock. With few exceptions, birds are generally raised by women in an extensive production system, as found in other developing countries and characterised by scavenging with occasional food supplementation, natural incubation and small flock sizes.

The principal roles fulfilled by traditional poultry and poultry production are:

- to contribute to household food security
- to generate income that is used for medical expenses and to pay children's school fees
- to provide gifts for visitors, as a mark of respect.

During the past 10 years, the Togolese government reformed livestock services by redefining the role of public services and admitting private veterinary services. The number of private veterinarians grew from 1 in 1991 to 45 in 2004. The private sector now represents 50% of veterinarians registered by the national veterinary board. Meanwhile, non-government organisations (NGOs; primarily Vétérinaires Sans Frontières France) built up an effective delivery of livestock services by training community livestock workers.

The community livestock worker system as a first stage for Newcastle disease control

The strategy used to deliver livestock services was to train villagers to provide animal health care as community livestock workers (CLW). The training program includes poultry health care, community capacity, livestock sensitisation, health care and information on zoonoses. The criteria usually used to select CLWs are: married, live in the village, and have a minimum education in French (courses are delivered in French).

The education program also includes food crop production techniques such as natural fertilisation by biological means. Today, Togo has a national network of 1,400 CLWs.

After a public debate that concluded in 2004, there is now a law that describes the skills, the methodology of education, the level of study of trainers and a follow-up strategy for control and training of CLWs.

Trainers are private veterinarians, agents involved in extension programs for rural development, and public-service veterinarians. The duration of the training is 7 days.

The vaccine used against ND is one adapted for village conditions (heat resistant and cheap). The price for 100 doses is FCFA2,700 (the price of two guineafowl). The CLW takes a profit from vaccinating and from other drug sales (especially antiparasitics). The annual average income per CLW generated by livestock healthcare is FCFA60,000 (the annual salary for a rural Togolese is FCFA200,000).

A study took place in 2003 (CEFRAP–VSF 2003) to determine whether or not people have similar expectations of the characteristics of a good CLW. Different groups (except CLWs) were invited to give their opinion about the requirements to be a good CLW (Table 1). Questions were asked of those who were familiar with CLW activities.

The results show that priorities depend on whether the respondent is a farmer, a private veterinarian or a public-service veterinarian. Farmers focus their requests on CLW skills and accessibility (live in the village, selected by the community and having skills in other animals) while veterinarians extend CLW skills to those that are necessary to control their activities (have close relations, importance of education level).

Lessons learnt

Lessons learnt from the survey were that:

- the conditions for CLW selection should be adhered to
- CLW training should be extended from poultry to pigs, cattle and small ruminants because smallholder farmers usually raise those as well

- trainers of CLWs must come from different services and they must have different skills (private veterinarians, extension agents, public-service agents etc.)
- CLWs should be guided to form groups in order to facilitate their relationship with the public service, veterinarians and farmers.

These results have helped to redefine the curriculum of CLW training and to set up procedures to control their activities.

Drug provision system for community livestock workers: lessons from an unsuccessful experience

A national program for small-scale livestock production took place between 1992 and 1998. It aimed to help smallholders to improve livestock production in order to assure rural households of food security, enhance income-generating activities and reduce poverty. Vétérinaires Sans Frontières (VSF) was a partner in the program.

In order to continue VSF experience in implementing a local livestock healthcare delivery, the program initiated a system by which communities could easily access drugs if they had a CLW. A total of 300 community drugstores (CDs) were implemented in Togo's northern regions (Savanes, Kara and Centrale regions), which are the most productive in traditional poultry.

The main objective of the CD was to facilitate the task of CLWs by providing the basic drugs needed, particularly for CLWs living far from main roads. The program carried out the CD system as a gift for the village community. The following preconditions were set:

- The CD would be managed by a CLW.
- The CLW CD activities would be controlled by two committees—a committee of control and a committee of management, both of which would meet monthly. The role of the management committee was to ensure that the official selling and purchasing system was applied. The control committee's task was to check that all expenses were legitimate.
- The first drug supply was donated by the project. Further CD supplies had to be provided by resources from CD operations.

Two years after implementation of the CD program, a study was made of its operation (Bebay et al. 2000). Information was collected from three sources, as follows:

- A questionnaire was circulated to 60 CDs in two regions (Savanes and Centrale)—the results presented here concern only 12 of them, but the trend was the same for all CDs.
- Discussions were held with CLWs and various members of the committees involved.
- A general survey was conducted in association with the program's field operations.

Table 2 details the questions the study sought to answer and Figures 2–5 the distribution of responses.

CDs were supplied with drugs for chickens, small ruminants and cattle (Figure 2), although CLWs are not trained to care for small ruminants or cattle. CLW skills have not been entirely taken into account.

Table 1. Survey respondents' expectations of a good community livestock worker (adapted)

According to you, what is a good community livestock worker?	Farmers (%)	Private veterinarians (%)	Public-service veterinarians (%)
Be a poultry producer	50	100	94
Chosen by the community	85	80	63
Live in the village	100	80	94
Be married	60	60	69
Importance of education level	24	60	83
Have close relations with veterinarians and public service, produce reports for them for evaluation, supervision and monitoring	3	10	100
Be of good moral standing	70	75	–
Have skills to treat small ruminants, pigs and cattle	100	30	5

Table 2. Information sought in the study of community drugstore (CD) functioning

	What we wanted to know	Parameters
When the CD started	Were community livestock worker (CLW) skills considered when we supplied the CD? Was the CD accessible to a CLW in terms of money?	Drugs class Global value of the CD
After 2 years running	Were smallholders' drugs requirements correctly considered (quantity and quality)? Were CD financial operations well conducted? Were the two committees managing and controlling CD operations effectively?	CD most- sold drugs CD less-sold drugs CD debts CD funds Number of different meetings of committees

Drugs held by CDs were predominantly antiparasitic (skin or oral route) formulations (Figure 3). Only antiparasitic drugs were held for small ruminants and cattle drugs. CDs held no vaccines because vaccination had been abandoned in favour of personal business by the CLW.

Values of CDs differed, for no logical or identifiable reason (e.g. number of smallholders, chicken population, CLW experience etc.). The average value of a CD was FCFA210,000 (Figure 4); more than a Togolese farmer's annual income. We are convinced that the value of CDs was too high.

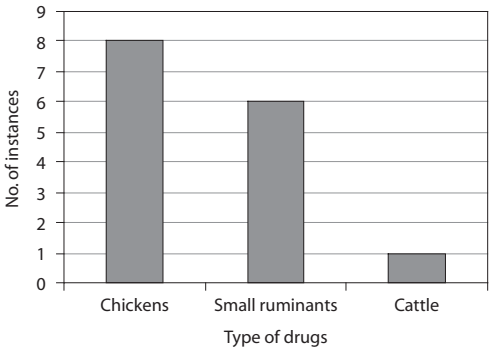

Figure 2. Livestock species serviced by community drugstores

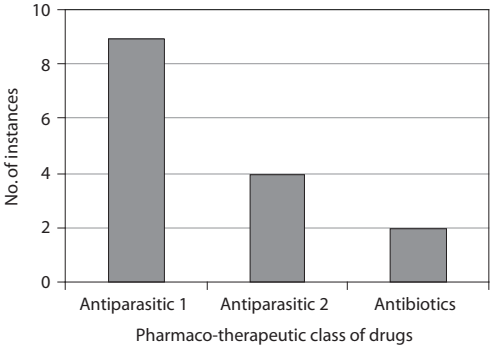

Figure 3. Therapeutic classes of drugs held by community drugstores (antiparasitic 1, skin route; antiparasitic 2, oral route)

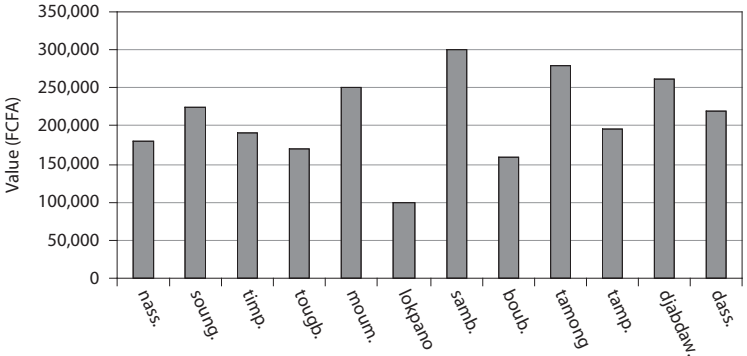

Figure 4. Value of community drugstores (in Franc Communauté Financière Africaine; 1 € = ca FCFA666,000)

Losses, debts and funds were calculated in relation to initial CD value. 1. Losses are unrecoverable debts and outdated drugs. 2. Debts are monies that smallholders should pay to the CD. 3. Funds are monies hold by CLWs plus banked funds. Profit in drug selling traditionally ranges from 20% to 50%. So a CD could be considered in a catastrophic situation if losses plus debts are greater than 30%.

The financial situation of eight of the CDs was disastrous after 2 years (Figure 5). Most of them were not able to guarantee further drug supplies, because they had insufficient funds.

Committees were supposed to meet monthly. While the number of meetings may be taken as an indicator of their performance, the financial situation of the CD must also be taken into account.

What can be deduced from the results in Figure 6 is that committees were largely inoperative. A second point is there is no linkage between the financial position of a CD and the activity of its committees. The committee of control of the Dassoutte CD, for example, held 24 meetings, but its financial position was worse than that of the Nassiette CD.

These results led us to question the capability of committees to help CLWs in managing CDs.

Lessons learnt

1. The global value of CDs was high in terms of money and quantity of drugs. CLW management capability was not enough to ensure their sustainability.
2. The CLW had no profit from CD operations. In our opinion, this was a mistake because the experience added two conflicting notions of interest: personal (the CLW is paid by farmers when vaccinating against ND) and general (the CD is owned by the community). People involved in CD management have no interest in its success. That is why the committees failed.

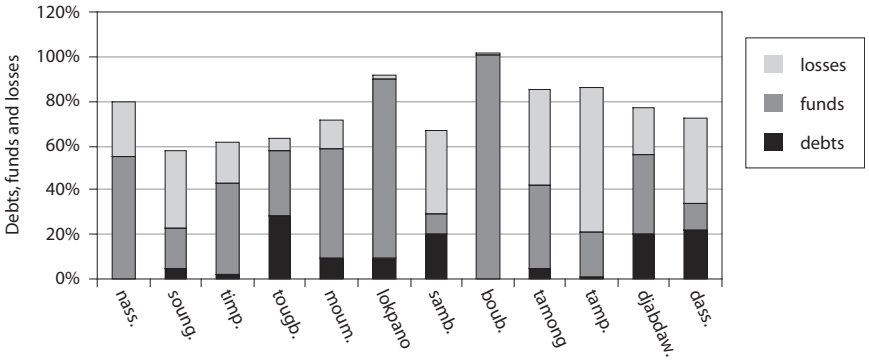

Figure 5. Financial status of community drugstores after 2 years of operation

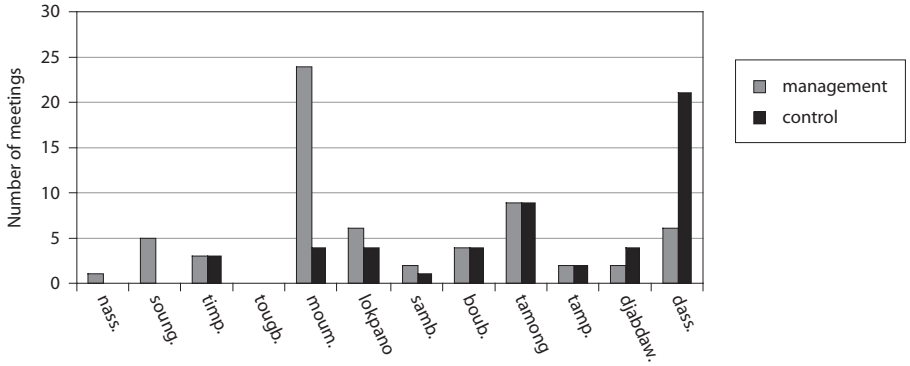

Figure 6. Functioning of committees

3. Drugs were given to the community as a gift at the end of the project and there was no system of support in terms of management.
4. Drugs could have been provided by a veterinarian via a credit system. This would likely have helped the CD to better manage credit given by the CLW to farmers. However, cash payment for drugs was expected; meanwhile, the CD managers gave credit although they were not supposed to. This created a fatal break for CD funds. For sociological and marketing reasons, we should have provided credit.
5. Farmers felt that those involved in CD management owned it. This led to envy and some of them came into conflict with the CLW, then refused to allow them to treat their birds.

Rural radio: an effective tool to train smallholders

In collaboration with a local NGO (Promotion et Action des Femmes pour le Développement), rural radio was tested as a tool for extending good practices in rural poultry development. The experience involved four local radio stations (Table 3) in the Centrale region and took place between September and December 2003.

Rural radio was seen as a potentially effective tool to train smallholder farmers in poultry development because:

- generally speaking, a radio can be found in almost every rural family
- rural families listen to the radio all day long, during their daily tasks
- most medium-size cities now have their own local radio station
- radio stations broadcast in several languages and most programs are broadcast in local languages.

Part one: production and broadcast of taped documents

Documents were written in the three languages—kotocoli, kabye and tchamba—that are the most used in the region. Programs were recorded in villages. Skilled farmers were invited to speak to fellow farmers in the local language. A fourth version of documents was written in French.

Trainers were invited to present the programs. They talked about their own experience in terms of resolving common problems in village poultry production (vaccination against ND, other treatments, improved housing, flock management, daily tasks, feeding, brooding system, management of day-old and young chickens). There were 10–20 people (men and women) for each recording. Each radio station prepared one program, then tapes were exchanged between them. Stations broadcast each tape four times, between 6 and 7 pm.

Part two: assessment

Thirteen villages of 118 receiving radio coverage were selected for assessment of the broadcast radio programs. These villages had no previous experience of poultry development activity. So we estimated that people were likely to be unaware of poultry development principles. Ten people per village (7 men and 3 women) answered a questionnaire (Table 4).

Lessons learnt

Radio is a useful medium for disseminating information on ND control. Radio messages made a big impression on farmers and could be a good means to prepare for intervention in villages.

Table 3. Characteristics of the radio stations involved in disseminating information on good poultry practices

Name of the radio station	Administrative division	Radio broadcasting range (in km)	Number of villages covered
Cosmos	Prefecture de Sotouboua	60	65
Jeunesse	Prefecture de Tchaoudjo	25	25
Espoir	Tchaoudjo	125	25
Tchamba	Prefecture de Tchamba	35	28
Total			118[a]

[a] Some villages are covered twice

Table 4. Results from the survey of listeners to radio broadcasts about poultry development

Préfecture	Listening rate (%)	Improved house-building principles (%)	Daily tasks in poultry production (%)	Measures during an outbreak (%)	CLW[a] role (%)	Vaccine cost (%)	Things listeners would like to hear about	What listeners appreciated	What listeners did not appreciate
Sotouboua	91	28	56	76	94	87	Small ruminants health care, housekeeping (how to build housing)	Use of local language, the fact that interviews were made with fellow farmers	Short time of document, use of French language
Tchaoudjo	89	35	65	83	91	78	Small ruminants health care, housekeeping (how to build housing)	Use of local language, the fact that interviews were made with fellow farmers	Short time of document, use of French language
Tchamba	98	16	63	67	88	77	Small ruminants health care, housekeeping (how to build housing)	Use of local language, the fact that interviews were made with fellow farmers	Short time of document, use of French language

CLW = community livestock worker

Women's role in poultry production: varied local realities

A comparison was made of the role of women in village poultry production, before and after dissemination of poultry development information (Table 5).

What we can say is that, in Savanes region, improving traditional poultry production has a negative effect on leadership by household women. As poultry production becomes commercial, men keep women away from important management decisions. There is no arrangement between men and women in using income from poultry production.

In the Kara and Centrale regions, women's leadership increased and there is an arrangement between men and women about income use.

The situation in the southern regions has not changed. Women keep money for their own business, but they use money for expenses that are traditionally men's.

Enhancing an effective marketing system: a way to scale up traditional poultry production

Despite the improved practices that have been implemented since the beginning of the program, smallholders have not yet integrated systematic commercial practices in terms of selling birds in Togo (Table 6). Most of them are still keeping chickens in their courtyard, expecting to sell them only when they need urgent expenses. Reasons for this are that:

- they do not wish to have a lot money at once because they fear thieves and envy
- they are proud to have a large number of birds
- they fear disease
- according to them, if they sell too many birds at the same time, the price will fall.

This is not the most profitable management strategy, because birds are kept and fed for too long. Costs incurred by the long stay are not reflected in the sale price, which is fixed by the market. The situation is worse when the bird population increases and competes with humans for cereals.

Means to boost income from poultry production and sales could include:

- encouraging networks between producers and marketers in order to improve business relations and induce producers to sell when the bird is ready
- providing market information (rural radio could be a good means to this)
- linking producers with local savings banks in order to facilitate credit access to them after deposits of savings from income generated by poultry production.

Table 5. Comparison of tasks associated with village poultry production before and after introduction of good practices in traditional poultry production

Region	Before	After	Results
Savanes	Feeding, selling chickens	Feeding, looking for maggots or termites	Women's leadership decreased
Kara/Centrale	Feeding, deciding when to sell chickens	Looking for maggots or termites, feeding, deciding when to sell chickens, selling chickens, deciding whether to eat chickens, deciding whether to vaccinate chickens	Women's leadership increased
Plateaux/Maritime	Feeding, deciding when to sell chickens, selling chickens, deciding whether to eat chickens	Looking for maggots or termites, feeding, deciding when to sell chickens, deciding whether to vaccinate chickens, selling chickens, deciding whether to eat chickens, deciding to introduce a new cock	Women's leadership is the same

Table 6. Summary of the strengths and weaknesses of traditional poultry marketing in Togo

Type of birds	Products frequently sold	Marketing strengths	Marketing weaknesses	Possibility of marketing or production strategy to scale up the production and increase smallholder income
Chickens	• Young hens • Cocks	• Frequently used for traditional ceremonies • Most eaten • Resistant during a trip, principally against heat	• Low weight	• Enhance the weight with feed supplementation or with a heavier cock • Possibility to sell young and old chickens
Guineafowl	• Eggs • Male and female	• Significant market value	• Fragile when the trip is long during hot season • Seasonal production • Eggs are hard to keep and transport	
Local turkeys	• Male and female	• Significant market value	• Very customer based (price and taboo)	• Target fast-food makers and restaurants • Slaughter and sell in parts.

References

Bebay C., Badjé Y., Djinadji K. 2000. Les caisses de pharmacies vétérinaires villageoises—analyse rétrospective d'une expérience au Togo—October 2000. Vétérinaires Sans Frontières.

CEFRAP–VSF (Centre d'Etude de Formation et de Réalisation Agro-pastorale – Vétérinaires Sans Frontières 2003. Social role of community livestock workers. CEFRAP–VSF: Togo.

MOA (Ministry of Agriculture) 2004. Togo, program détaillé de développement de développement en Afrique (PDDAA—mai 04). Ministère de l'Agriculture, de l'Elevage et de la Pêche du Togo.

World Bank 2003. Stratégie de croissance du secteur rural—Togo. World Bank: Washington, D.C.

Thirty years of fighting Newcastle disease in rural poultry in West Africa

E. Fermet-Quinet[1]

Abstract

Control of Newcastle disease (ND) is of major importance for rural poultry. Since 1978, French Cooperation and Veterinaire Sans Frontières-France have used a commercial inactivated vaccine (ITA-NEW) adapted for village use. This led to an estimated 15 million vaccinations annually in West Africa. This vaccination relies on private veterinarians, trained farmers, full-cost recovery and massive radio broadcasting of the campaign, with an immense benefit for rural poor and very little public funding. Burkina Faso, Mali and Togo could be considered as reference cases for Africa.

In 2005, Inter African Bureau of Animal Resources of the African Union started to disseminate this methodology in East Africa. It was confronted by the weakness of support policies for both private veterinarians and rural radio networks. Nevertheless, ND vaccination in rural areas has played an important role in the building of the private veterinary network in West Africa.

There is an urgent need to launch a continental pan-African ND control campaign using West African experience, as well as a requirement for continuing research for a new live vaccine to assist in the control of the disease.

Introduction

Rural poultry development programs started in the 1950s in Africa with various aspects targeted for support, including genetics, feed, shelter and marketing improvement. By ignoring the Newcastle disease (ND) epizootic and the importance of its control, these programs widely failed. This contributed to an undermining of interest of the development agencies in rural poultry and the promotion of industrial poultry production.

In 1978, a pilot program of French Cooperation, the Programme de Development de l'Aviculture Villageoise (PDAV), started in Burkina Faso with a commercial, inactivated ND vaccine specially packaged for the rural poultry of poor farmers. The success of this program led Vétérinaires sans Frontières (VSF), a non-government organisation (NGO), and French Cooperation to disseminate it to almost all of West Africa and parts of Latin America and Asia.

The Burkina Faso pilot action

Rural poultry production was identified as a major possibility to provide fast income generation and food security for the rural poor. As ND was a major constraint to this production, the PDAV established an agreement with the veterinary drug distributor Laprovet to adapt the bottling of the Italian vaccine ITA-NEW, which was already known for its relative thermostability. The PDAV tested a 100-dose bottling under the following conditions:

- a unique intramuscular injection of 0.5 mL each year about 2 months before the regular outbreak season

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- a global recommendation of vaccination of every chick at 2 months of age
- distribution of the vaccine by the veterinary services, storing it in a refrigerator at district level
- the vaccination to be done by a trained farmer in each village, storing the vaccine in humid sand jars for a maximum of 3 weeks
- a massive radio broadcast campaign promoting ND and ITA-NEW
- a local and national competition for vaccinating farmers.

In the 1980s, the PDAV maintained an average vaccination number of 2 million chickens per year. The success of this initial program led VSF and French Cooperation to extend such vaccination programs over virtually all of the rest of West Africa (i.e. Togo, Benin, Côte d'Ivoire, Mali, Senegal and Niger).

Reference cases in Africa

Different strategies have been applied to the particular circumstances in each country, but three countries can be selected to exemplify factors contributing to the success of the program:

- Burkina Faso for its leading and initiating role, its research and development findings on rural poultry, and its development of policies and programs for small-scale rural village animal production
- Togo for its unique national rural poultry policy involving private veterinarians for distribution and training, farmers for vaccination, and VSF for technical consulting
- Mali for its very rapid pick-up and sustainability of ND vaccination.

The Mali case

Before 1994, there was virtually no ND vaccination in Mali. Starting with a local program in Sikasso region (2,000 villages), it expanded to 1 million vaccinations in 1995, 2 million in 1996, and more than 3 million in 1997 when the support program finished. The training was extended to other regions from 1998 to 2001. From 1998, private sales of the ITA-NEW vaccine by rural veterinarians have oscillated between 3 and 6 million doses. Some sales to Côte d'Ivoire and Burkina Faso were reported. During the same period, fair competition of new laboratories, unfair competition of a few public programs, and fake vaccine were periodically developed, showing that the ITA-NEW vaccine had become of economic interest.

The Mali program relied on full and immediate private sector involvement, no subsidies for the vaccine and training of the farmers by private veterinarians. The public funds were used only for training materials, training of veterinarians, radio broadcasting and posters (one in each of 5,000 villages), and a competition for trained farmers and veterinary trainers. During the first 3 years of the campaign, the direct payment of the private veterinarians for training farmers and extension at the village level appeared to be extremely cheap and efficient compared with public-service or NGO delivery of these services, which would cost from 10 to 100 times more. Up to now, sustainability has been maintained by fully private initiative. It is a concern not to see any public support for permanent provision of basic information on the importance of ND vaccination. Mali has an estimated 20 million rural poultry.

Tracing the costs, benefits and sustainability

Field data collection and analysis made in the project reports from French Cooperation and VSF France in West African countries led to the following estimates:

- the average cost of a vaccine dose for a poor poultry farmer is around €0.1
- the average benefit for the farmer is estimated to be €2–10 per year per dose, depending on rural poultry marketing conditions and the global epidemiological situation (including vaccination rate)
- the annual national public budget necessary for training and promotion is in the range €5,000–30,000 for the first 3–5 years. Less than €5,000 per annum is needed to maintain public awareness.

The benefits to the national economy (both internal production and export), to food security and to income generation for the rural poor, especially women, are well documented by English-speaking authors.

Program sustainability relies entirely on the existence and involvement of a private veterinary

network, not only for vaccine distribution, but also to adapt to the evolving circumstances surrounding rural poultry production. After successful control of ND, other problems occur at lower intensity and on a more individual basis. To solve these does not require a special or massive campaign, but could be solved by some extra training of veterinarians. In fact, the ND vaccination campaigns have contributed much to establish and reinforce the private veterinary network (secure activity and revenue, field contacts and training).

Dissemination is promising in East Africa, but is limited by structural constraints

In 2001, French Cooperation funded the program called 'Regional action for livestock in East Africa' (RALEA) in Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Tanzania and Uganda. This program was devoted to regional common action related to poultry and dairy production. It was executed by the Inter African Bureau of Animal Resources of the African Union (AU–IBAR). Preliminary studies showed that, in all the countries except Tanzania, there was practically no ND vaccination of the estimated 200 million rural poultry, while at the same time 15–20 million vaccine doses were being sold in a sustainable way to the poor farmers of West Africa. As the main task of the African Union is to contribute to African continental integration, it was decided to transfer experience from West to East by editing an interactive CD-ROM and starting extension with the agreement of national authorities.

A first version of the CD-ROM is available. It contains, in three languages (French, Arabic and English), a reference methodology, a technical guide for veterinarians (rural poultry field medicine, training of farmers, autopsy), a technical guide for farmers, radio messages, and posters and pictures. The farmers manual allows production of an adapted national version: editors can insert any national language for literate farmers, and replace pictures with those of their own countryside.

In 2005, RALEA started training of private veterinarians in Burundi, Kenya, Rwanda, Tanzania and Uganda. It was intended to extend training to Ethiopia, Eritrea and Sudan in 2006. This training has been performed by West and East African consultants who noted the high interest of private veterinarians. There are, however, two major constraints to any animal production development strategy in East Africa:

- the weakness of national support to private veterinary networks—they are confronted with unfair competition favouring merchants, public service programs, and NGOs promoting second-hand systems
- the lack of a network of local radio stations in rural areas considerably increases the cost of extension. In some East African countries, a first estimate showed that the cost is 10–70 times higher than that in West Africa, where radio is a primary extension tool.

Recommendations: to pledge for a coordinated pan-African fight against Newcastle disease

As a first step, the AU-IBAR CD-ROM must be improved by adding new data, more detail on methodology and its adaptation to local sanitary contexts, better and more translations, and better functionality.

As a second step, the AU–IBAR could raise a priority fund for pan-African control of Newcastle disease in rural poultry. Experience from the campaign in West Africa indicates that an annual budget of €1 million for 5 years would be sufficient.

As a third step, a coordinated pan-African research program on rural poultry must target priorities such as further research on live vaccines to achieve ND control, on adapting vaccines for control of emerging diseases in rural poultry (Gumboro disease, fowl pox), and on characterising local poultry breeds to protect biodiversity.

Improving resource-poor households' participation in the adoption of poultry production innovations

Harry Swatson[1], Siyabonga Mazibuko[1] and Bonaventure Byebwa[2]

Abstract

Improving household protein food security and livelihoods in resource-poor areas will require the introduction and adoption of innovative ways of raising chickens. A study was conducted to determine the impact of promoting smallholder poultry development amongst poor communities. The objectives were to identify educational strategies associated with the adoption of poultry production and how farming households determined what course of action to take to improve upon their productive process. In general, individuals in households lacked the required economic or market-related information on family poultry production. This had an adverse impact on the way they adopted new ways of rearing chickens on a commercial basis. Decisions were based on an assessment of the cultural, religious and socioeconomic usefulness and on observable results from other experienced farmers. Information and communication networks had a great impact on the adoption decisions of respondents. Very few individuals made use of a variety of information sources before and during the adoption of a decision on how to keep chickens profitably. Reliable sources of information played a critical role in promoting the adoption of poultry knowledge and practices. Besides extension workers and 'consultants', farmers preferred their own experiences and knowledge. It has become evident that there is a need to give sufficient recognition to the value of local agricultural knowledge. Interactions with other experienced farmers in the community tended to improve farmer skills and knowledge in poultry production. This background calls for the development of approaches and methodologies to facilitate the involvement of rural households at all stages of project initiation, development, implementation, and monitoring and evaluation. This will ensure that households are able to either do away with inappropriate technologies early in the evaluation process, or adopt promising poultry production technologies.

Introduction

In South Africa, primary agriculture permanently employs approximately 800,000 individuals and 600,000 individuals seasonally on about 75,000 farming units with 8–16 people per unit. Total employment in the informal sector on small-scale and subsistence farms is approximately 1.7 million. About 7–12% of all poultry farm workers are unionised, with more than 78% of all farm workers being illiterate. Local poultry knowledge is based predominantly on practice and past experience. There is a critical shortage of agricultural scientists, especially poultry scientists and extension workers who have practical knowledge of smallholder poultry-rearing techniques. Most commercial farms are located in

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rural areas and 98% of these breadwinners or their families keep small- to medium-size flocks of chickens. The productivity of local breeds of poultry can be improved through better poultry husbandry practices, improved genetics and the creation of a niche market for poultry products. There is very little evidence to indicate many rural/peri-urban farming households intensively raise large numbers of hybrid broiler and layer exotic chicken breeds. Where broiler chickens are kept, this is done to generate additional family income. The enterprise is carried out part-time until the income generated is enough to meet all the needs of the household. Commercial poultry breeds (i.e. Ross, Cobb) are either purchased at 3 or 6 weeks of age from large commercial producers and grown until they meet the size demanded by customers (8–10 weeks old, 2.2–2.8 kg live weight) or marketed within a few days of purchase. It must be noted that the target market for these birds requires a tougher meat from a mature bird, similar to that obtained from free-ranging indigenous chickens.

Very few farming households rear day-old chicks to 6 weeks of age, probably because they do not have the required poultry-rearing knowledge and skills. Most losses of chicks during rearing, processing and marketing have been attributed to institutional, technical and economic constraints. Some of these constraints can be overcome through hands-on training, extension and technical follow-up within a favourable institutional environment. Apart from the difficulty encountered by resource-poor households to obtain start-up capital or credit, the necessary training in poultry rearing techniques, if available, costs far beyond what they can afford. Compounding these problems is the lack of access to inputs, due to high transport and transaction costs, and a lack of niche markets. Recommendations from our previous studies and workshops indicate that there is a great need for the training of trainers and training of households in poultry-rearing techniques (Swatson et al. 2001, 2003, 2004). It was also recognised that the benefits of training and technical assistance would have greater impact if the associated institutional and technical constraints to smallholder poultry production were removed. To identify basic requirements for the successful implementation of poultry training programs or projects, a series of participatory studies was conducted.

Purpose and objectives of study

A series of studies was conducted to determine the impact of promoting smallholder poultry development among peri-urban and rural farming households. The objectives were to identify educational strategies associated with the adoption of poultry-production techniques and how farming households determined what course of action to take to improve their productive process. The study would also shed some light on possible interventions to assist in improving small-scale poultry production among farming households.

Methodology

A sample of 300 individuals was randomly selected from households in peri-urban and rural areas. Equal numbers of males and females were selected. The ages of these individuals ranged from 16 to 67 years. Qualitative data obtained from focus group interviews were used in the design of other surveys that made use of multiple-choice and scale-type questions. Confidentiality of information was provided and maintained for individuals that were interviewed. Descriptive statistics were used to analyse survey data making use of Minitab Statistical Software (1998).

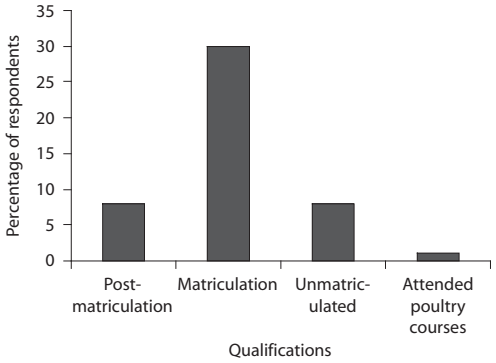

Figure 1. Qualifications and training of respondents

Results and discussion

Respondents had a limited knowledge of how to successfully and efficiently rear and market commercial broilers. Less than 2% of the respondents had attended poultry courses (Figure 1). There was a lack of interest in rearing day-old chicks to 6 weeks of age by farming households without the

required training, extension and financial support. This was partly due to the low level of information on issues such as brooding requirements for chicks, appropriate housing, disease control, technology and equipment, value adding and niche markets, financial management, micro-credit and record keeping. To develop a positive attitude towards poultry rearing as a commercial enterprise, respondents need to be aware of the importance and value of the basic principles of poultry production.

The study showed that, in evaluating the adoption of poultry-rearing techniques, individuals in farming households determine if it:

- is not risky or associated with losses (i.e. birds, incomes)
- improves the source of additional income of the household
- improves the protein food security and livelihoods of the household.

As the understanding of rearing practice increases, interest in its adoption also increases. Few emerging farmers were sceptical about spending money on disease control and supplementary feeding as a measure to reduce the risk in growing larger numbers of chickens. In general, local poultry-rearing knowledge was based on farming practices and past experience.

The most knowledgeable and trustworthy sources of poultry-rearing information were extension agents who had specialised knowledge in poultry production (Figure 2). Knowledgeable and trustworthy information sources significantly influenced the respondent's adoption decision. Even although farming households had a low and unreliable access to inputs, micro-credit, extension and veterinary services, these services were not relevant to their needs. For instance, 95% of the respondents kept Venda or Ovambo free-range birds but information available was on Ross broiler chickens that are not adapted to the harsh environment faced by village chickens.

The most accessible and convenient sources of poultry information were local poultry dealers (Figure 3) from whom farming households could obtain chicks, equipment and some veterinary medicines. Extension agents tended to live far from communities and farming households, and their visits to households were irregular.

Poultry information was communicated to households mainly through extension visits and during meetings held with households by extension agents, non-government organisation (NGO) staff, community field workers and local poultry companies (Figure 4). Farmers also tended to lack the knowledge and skills needed to make correct use of inputs (e.g. Newcastle disease vaccines, automatic drinkers and gas brooders).

The adoption rates of poultry-rearing practices for indigenous free-ranging chickens were highest for supplementary feeding and housing. Most respondents protected their birds from adverse weather conditions and provided supplementary feeding—making use of kitchen waste, termites and leafy/unconventional protein sources. Acquiring information or skills from trustworthy, knowledgeable and convenient sources was based on the farming household's own experience, interactions with other experienced poultry farmers and extension agents. This played an important role in adoption of poultry-rearing innovations (Figure 5).

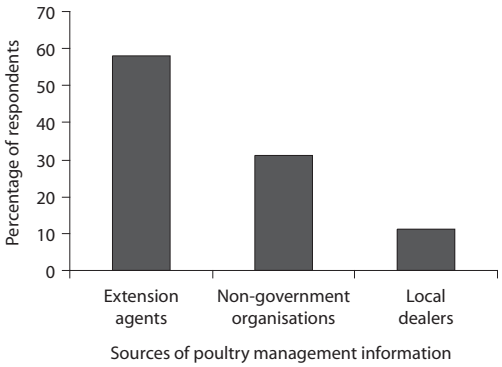

Figure 2. Sources of knowledgable and trustworthy sources of poultry management information nominated by respondents

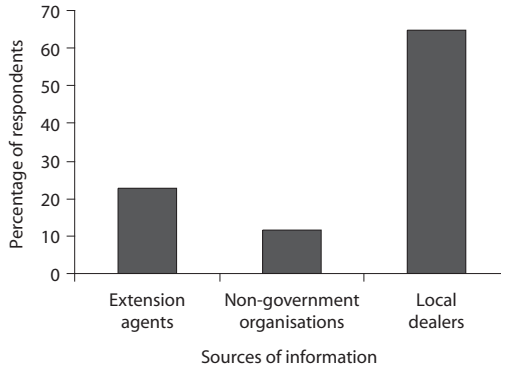

Figure 3. Sources of poultry information identified by respondents as being accessible and convenient

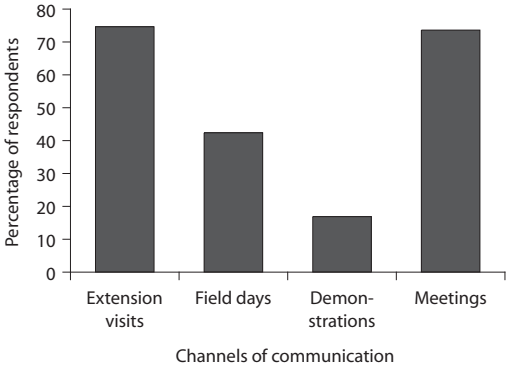

Figure 4. Channels of communication of poultry-rearing information to farming households

It is important to provide training to people working with communities so that they will be well equipped to provide trustworthy and practical poultry-rearing information to farming households. The empowerment will require hands-on practical training in all aspects of poultry production under various systems of management at reputable institutions such as Cedara College of Agriculture. The empowerment will promote competence of these trainers. Communication networks and farming cooperatives had a large influence on adoption decisions. It is suggested that the South African Network for Smallholder Poultry Development, in collaboration with relevant stakeholders, should establish an overall strategy on the sustainable use of poultry in poverty reduction and income generation amongst peri-urban and rural households. As not many institutions and NGOs engaged in poultry development projects have the required experience and skills in poultry production, collaborating and combining forces will establish a partnership drawing on and complementing individual strengths. A farming household's practical poultry knowledge is increased by interactions with other experienced poultry farmers and extension agents. This background calls for the development of practical approaches and methodologies to facilitate the involvement of rural households at all stages of poultry project initiation, development, implementation, and monitoring and evaluation. This will ensure that households are able to either do away with inappropriate technologies early in the evaluation process, or adopt promising poultry-production technologies**.**

Conclusions

For small- to medium-scale poultry enterprises to be socioeconomically viable among peri-urban and rural households, issues such as the training of interested households, trainers and field staff in poultry-rearing skills need to be addressed. The provision of relevant socioeconomic and technical information to households is necessary, because most individuals are dependent on economic criteria for making an adoption decision. Furthermore, households are able to sufficiently grasp the basic principles and concepts of poultry rearing if they have been involved at an early stage of planning and implementation of appropriate poultry-rearing technologies. Inappropriate use of technology results in poor credibility and reliability ratings for an innovation

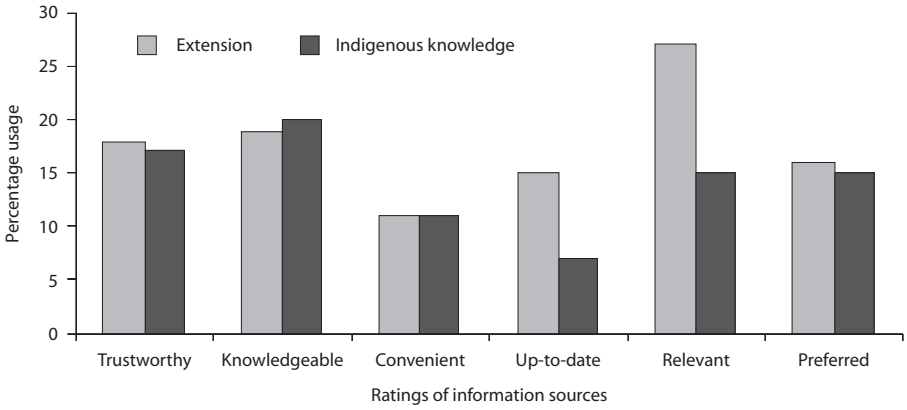

Figure 5. Respondents' usage ratings of poultry information sources at their disposal

and its adoption. Legitimate claims of resource-poor farming households to institutional support and resources should receive greater recognition through initiatives of the KwaZulu Natal Department of Agriculture and Environmental Affairs such as the *Siyavuna* and the agricultural outreach project of Cedara College of Agriculture.

References

Minitab, Inc. 1998. Minitab release 12.1. Minitab, Inc., State College, PA, USA, 16801–3008.

Swatson H.K. Nsahlai I.V. and Byebwa B.K. 2001. The status of smallholder poultry production in the Alfred District of KZN (South Africa): priorities for intervention. Pp. 143–149 in 'Livestock, community and environment', Proceedings of the institutions for tropical veterinary medicine, 10th international conference, 20–23 August 2001, Copenhagen, Denmark.

Swatson H.K, Sonaiya E.B. and Dolberg F. 2003. Recommendations for an overall strategy regarding the use of poultry in poverty reduction. Pp. 127–130 in 'The potential of free-ranging poultry development in improving livelihoods and food security of rural households', ed. by H.K. Swatson, I.V. Nsahlai, F. Dolberg, P.A. Iji and D. Umesiobi. Proceedings of the 1st national workshop on indigenous poultry development, 29–30 October 2003, Pietermaritzburg, South Africa.

Swatson H.K., Tshovote J. and Nesamvuni E. 2004. Characterisation of indigenous poultry production under traditional management conditions in the Vhembe District of Limpopo Province, South Africa. In 'Proceedings of the XXII World's Poultry Science Congress, 8–13 June 2004, Istanbul, Turkey'.

The role of village chickens in HIV/AIDS mitigation in Manica and Sofala provinces of Mozambique

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Abstract

In households where there is a lack of able-bodied workers, such as those affected by HIV/AIDS, village poultry provide a source of income and high-quality nutrition without requiring much in the way of labour or financial inputs. Restocking with village chickens can be of utmost importance for poverty alleviation, as the poorest households and families affected by long-term disease such as HIV/AIDS find chicken raising an easy activity that can contribute to household food security and income. Given that women are the main carers of sick people, and that chickens are usually under women's control, chickens can play an important role providing them with additional resources to carry out their important task of supporting people living with HIV/AIDS.

This paper presents a case study on the improvement of village chicken production by junior farmers and people living with HIV/AIDS in Mozambique. The case study demonstrates methodologies that contribute to the wellbeing of both households and communities through improved food security and HIV/AIDS mitigation.

Introduction

Village chickens can be found in all developing countries and play a vital role in many poor rural households (Spradbrow 1993/94; Alders 2004; Alexander et al. 2004; Copland and Alders 2005). They require the lowest capital investment of any livestock species and they have a short production cycle. Village chickens play an important role in households where there is a lack of able-bodied workers, such as those affected by HIV/AIDS or those that have a disabled family member. In house-

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holds headed by widows, children or grandparents, chicken represent the easiest species to raise for sale and home consumption, providing a source of high-quality protein and micronutrients, which play an important role in the nutrition of HIV/AIDS patients. Eggs can be stored for several days under village conditions and require very little energy or time to cook.

Mozambique is among the 10 countries in the world most affected by HIV/AIDS. The national adult HIV prevalence rate is 13.6% (MISAU-PCN/DTS/HIV-SIDA 2003) but the highest prevalence rates (19.8%, 21.1% and 18.7%, respectively) are found in Tete, Manica and Sofala, three provinces in the centre of the country (INE/MISAU/MPF/CEP-UEM/CNCS/UEM/MINED 2002).

This paper presents a case study on the improvement of village chicken production by junior farmers and people living with HIV/AIDS in Mozambique. The case study demonstrates methodologies that contribute to the wellbeing of both households and communities through improved food security and HIV/AIDS mitigation.

Project description

The Food and Agriculture Organization of the United Nations (FAO) is supporting new pilot activities that can mitigate the effects of HIV/AIDS on food security and nutrition in Mozambique's Manica and Tete provinces. Within the framework of this project, FAO is currently supporting the International Rural Poultry Centre (IRPC) to pilot improved management of village chickens and the vaccination of the flocks of people living with HIV/AIDS in the framework of home-based care systems run by two local non-government organisations (NGOs), the Mozambican Association to Support Widows and Vulnerable Children (ASVIMO) and Kubatsirana.

One of the major constraints to the production of village chickens in Mozambique is Newcastle disease (ND). Community-based ND control programs improve the livelihoods of poor livestock keepers in Mozambique through the effective and sustainable control of this devastating disease. Other constraints include shortage of feed protein, especially for chicks and laying hens and, as a result of poor housing and husbandry practices, high chick mortality due to cold, heavy rains, and predators. Once ND control has been achieved in the project area, secondary constraints mentioned above are tackled by focusing on training in, and farmer experimentation with, low-cost improvements to village poultry husbandry. Once ND is controlled, producers will no longer need to hatch all their eggs to produce replacement stock and so the consumption of eggs becomes feasible. To ensure that the activities above are sustainable in the long term, the project also works with local health posts and primary schools to promote village poultry production and the consumption of poultry meat and eggs. Activities to improve farmer knowledge about avian and human nutrition are also used to discuss the components of a balanced diet for the farmers' families.

The IRPC secured funding from charity groups in Australia to support the distribution of one rooster and three hens and ND vaccination vouchers to child-headed households and families affected by HIV/AIDS in the project area. Following vaccination, the vaccinators present the vouchers to either ASVIMO or Kubatsirana to receive a payment for their services linked to the number of birds vaccinated.

Project achievements and challenges

The pilot project received a positive review, as it demonstrated the potential to deliver triple benefits: direct support to the people affected or infected by HIV/AIDS; income generation for the carers and the community-based organisations; and an increase in the carrying capacity of the communities in terms of supporting welfare activities (Sylvester 2005). The project has been expanded to more districts in five provinces and is ongoing. One major difficulty has been ensuring the supply and distribution of in-date ND vaccine. This is done via the Provincial Livestock Services to community vaccinators. It is needed to enable vaccination to occur at regular intervals so that flock immunity is maintained (IRPC 2005).

Discussion and conclusions

Improving the management of village chickens by families affected by, and people living with, HIV/AIDS contributes to HIV/AIDS mitigation, principally through improved household food security and income generation (IRPC 2005). Village poultry production also provides women and children with experience in small-scale business management and improved knowledge about human nutrition.

Families affected by HIV/AIDS are more likely to make use of the above benefits when veterinary

services work in collaboration with the ministries of Education and Health to improve general knowledge about human nutrition and disease prevention and control (IRPC 2005).

Acknowledgments

Support provided by the Australian Agency for International Development (AusAID), the Australian Centre for International Agricultural Research (ACIAR) and FAO to enable the authors to work with farmers to improve village chicken production is gratefully acknowledged. The authors gratefully acknowledge assistance provided by staff within government veterinary departments in each country and the various NGOs with whom we are collaborating. We would specifically like to acknowledge the support and enthusiasm of the late Mr Machona, the District Livestock Officer in Dondo, Mozambique, who, we deeply regret, was killed in a motor vehicle accident in May 2007.

References

Alders R. 2004. Poultry for profit and pleasure. FAO Diversification Booklet 3. Food and Agriculture Organization of the United Nations: Rome.

Alexander D.J., Bell J.G. and Alders R.G. 2004. Technology review: Newcastle disease with special emphasis on its effect on village chickens. FAO Animal Production and Health Paper No. 161. Food and Agriculture Organization of the United Nations: Rome.

Copland J.W. and Alders R.G. 2005. The Australian village poultry development programme in Asia and Africa. World's Poultry Science Journal 61, 31–37.

INE/MISAU/MPF/CEP-UEM/CNCS/UEM/MINED 2002. Impacto Demografico do HIV/SIDA em Mocambique (Actualização). Maputo, Mozambique.

IRPC (International Rural Poultry Centre) 2005. Improvement of village chicken production by junior farmers and people living with HIV/AIDS (Component of OSRO/RAF/403/SAF). Final Report to Food and Agriculture Organization of the United Nations, Mozambique, August 2005.

MISAU-PCN/DTS/HIV-SIDA 2003. Relatório sobre a Revisão dos Dados de Vigilância Epidemiológica do HIV – Ronda 2002. MISAU-PCN/DTS/HIV-SIDA: Maputo, Mozambique.

Sylvester K. 2005. The triple benefit programme. Assessment of pilot projects/micro projects implemented under OSRO/RAF/403/SAF in the context of HIV/AIDS and food and nutrition security. Food and Agriculture Organization of the United Nations: Maputo, Mozambique.

Spradbrow P.B. 1993/94. Newcastle disease in village chickens. Poultry Science Reviews 5, 57–96.

Characterisation of indigenous chickens under traditional farming systems in Limpopo province, South Africa

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Abstract

In order to contribute to the sustainability of livelihoods through the introduction of appropriate indigenous poultry production and marketing technologies, it is necessary to characterise chickens under traditional management conditions. This is part of a South Africa Netherlands Research Programme on Alternatives in Development activity. Accurate and reliable baseline data obtained will enable modelling of the impact of interventions and selection of indigenous poultry breeds to be used in development projects.

The indigenous chickens owned are scratch chickens and quite adapted to scavenging behaviour. The purebred Naked-Neck birds have a completely naked neck, whereas the crossbred type has a tassel of feathers on the front of the neck. The Venda breed is a multi-coloured bird with white, black and red speckle patterns. The comb is rosy in colour. They have a brooding instinct and are the dominant breed in Limpopo province. The Ovambo has a small to medium body conformation and a variety of colour patterns. The Ovambo is comparatively active in seeking food and may prey on small rodents. Fifty-seven per cent of the scavenging chickens roosted in trees during the night to avoid predators and survive the harsh environmental conditions.

Very high body weights are obtained for cocks and hens during the winter (1.89 kg ± 0.08 kg, 1.48 kg ± 0.07 kg), respectively, and spring (1.81 kg ± 0.03 kg, 1.47 kg ± 0.04 kg), respectively.

The number of cocks kept per household tends to be at its peak during summer (November–January). This number shows a downward trend in autumn (February–April) and winter (May–July), and rises again in spring (August–October). This autumn–winter fall in numbers may be linked to the seasonal utilisation of chicken for rituals and food. Summer is a planting season for most crops grown by households and a manageable number of chickens is kept in a semi-intensive manner in chicken coops or shelters. The eggs laid per clutch is within the range 7–13, with a length of lay per clutch of 13–18 days and a hatchability of 65.7%. The average egg weights (g), shell thicknesses (mm) and shell membrane thicknesses (mm) for the Ovambo, Venda, Naked Neck and Koekoek breeds were, respectively: 53, 51, 56 and 54; 0.35, 0.37, 0.40 and 0.35; and 0.018, 0.020, 0.034 and 0.026. The egg shell weights (g), albumen weights (g) and yolk weights (g) for the Ovambo, Venda, Naked Neck and Koekoek were, respectively: 6.35, 6.89, 6.94 and 6.46; 28.74, 27.93, 31.44 and 30.18; 17.86, 16.73, 18.02 and 18.62. The average ages of birds at first egg laying were 135 days for Ovambo chickens and 126 days for Venda chickens, a longer time to laying than that for the Leghorn (118 days). The average number of eggs produced per hen during its productive cycle was 126 for Ovambo chickens and 154 for Venda.

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Promoting community development through improved village chicken production in Chibuto district, Mozambique

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Abstract

Corridor Sands Limited (CSL), a Mozambican mining company and member of the BHP Billiton Group, has been granted a concession by the Mozambican government to establish a large mineral sands mine near Chibuto in southern Mozambique.

The heavy minerals are found in areas occupied by rural families that need to be relocated. This must be done with a great deal of sensitivity to their culture, social structures, health and livelihoods.

CSL has included improved village chicken production as one of its community development activities. The aim is to facilitate and improve village chicken production to help increase rural incomes and improve nutrition among rural families. To achieve this aim, CSL is working in collaboration with the Gaza Provincial Livestock Services and the International Rural Poultry Centre to promote:

- the control of Newcastle disease using I-2 ND vaccine
- increased awareness among school children and nursing mothers about improved nutrition
- improved poultry husbandry using low-cost practices.

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An analysis and assessment of perceptions of free-ranging indigenous chicken production among some households in KwaZulu Natal, South Africa

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Abstract

Food security and socioeconomic, religious and cultural considerations are some of the reasons why households keep indigenous chickens. Freely scavenging indigenous chickens contribute 16.5% of the total meat consumed by households and a negligible cash income is obtained from the sale of chickens. In order to identify basic requirements for the successful implementation of free-ranging poultry projects, a series of participatory studies was conducted to obtain reliable data on poultry production in KwaZulu Natal, South Africa. The objective of the current study was to review, analyse and assess public perceptions about the use of free-ranging poultry meat, and shed some light on the possibilities for interventions to assist in improving indigenous poultry production. The study also sought to identify and formulate strategies to exploit market opportunities among urban, peri-urban and rural dwellers. The sample for this survey consisted of some 300 randomly selected individuals from households. There were equal numbers of males and females, and respondents' ages ranged from 16 to 67 years. Eighty-seven percent of those who had eaten free-ranging chicken meat previously would eat it again. However, 13% of the respondents did not like the meat because it was too tough. Ninety-five percent of the birds are purchased/obtained as live birds and there is a lack of well-established distribution outlets such as supermarkets and butcheries where the processed meat could be purchased. There were a few hygiene concerns, as many birds were not slaughtered in certified abattoirs or passed as wholesome by a meat inspector. Also, some birds were not treated as humanely as are other livestock. There was a lack of awareness and interest in making use of indigenous chickens amongst 23% of city dwellers due to the low levels of information and awareness about the meat. Two pilot projects on free-ranging poultry have been set up at Richards Bay Minerals community development project and Weenen to promote indigenous free-ranging chicken production and consumption, and the interest has been astonishing. Breeds kept at these sites include the Venda, Ovambo, Koekoek and Naked Neck. It is possible that targeted educational and marketing strategies that keep in mind the multicultural backgrounds of communities could help to develop the indigenous poultry market.

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Synchronised hatching as a strategy for improving productivity of village chickens in Uganda: a case study in Rakai district

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Abstract

Rakai district is one of the rural districts of Uganda that has been hit hard by the HIV/AIDS epidemic. As a result, there is a big challenge presented by orphans who are either fending for themselves or are provided for by relatives. A village chicken project was initiated and implemented in Rakai district by Community Integrated Development Initiatives (CIDI), a non-government organisation, in collaboration with several stakeholders, between 2003 and 2005. The overall objective was to contribute to poverty alleviation among subsistence farmers. The project targeted 400 resource-poor households as the initial beneficiaries. These included four households headed by orphans, two orphanages, 50 female-headed households (most of them widows), 250 housewives and 94 men. The beneficiaries were organised in groups and trained in modern poultry-management practices such as disease control, and in how to synchronise hatching of chicks, using broody hens. Synchronised hatching ensures that clutches of chicks are of the same age. This simplifies management, especially in the provision of feed and in vaccination. The groups were provided with local village hens and Bovan cockerels for cross-breeding. This cross produced F_1 offspring, which in turn were crossed with commercial broiler cocks, to produce F_2 offspring. By the end of the 2 years, the project had made significant impacts. The major achievements included an increase in flock turnover, an increase in egg and chicken sales, increased crop yields as a result of using chicken manure, improved household nutrition, marked improvements in housing and living conditions, and an ability to pay dues for children going to school, as a result of increased household incomes. The main challenges faced by the project included a high requirement for concentrated feed for the birds as a result of adopting the synchronised hatching technology and the deep litter system, and outbreaks of diseases such as fowl pox and fowl typhoid. Newcastle disease was under control because of the tight vaccination schedule.

Background

Rakai district is located in south-western Uganda and people in this district have been devastated by the HIV/AIDS epidemic. The disease was first diagnosed here in 1983 and since then it has caused serious socioeconomic problems. The orphans left behind usually suffer most, although many of their relatives are engaged in taking care of them. Some of the orphans take care of themselves in child-headed households, while others become street children in urban areas because their parents sold off family property to get medical care during their sickness (Hunter et al. 1993). One way of assisting such households is to help them and the community at large to utilise the locally available resources, such as village chickens, to generate income.

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Village chickens are found in almost all households in Rakai district (UBOS 2002). Haslwimmer (1994) suggested that village chickens are a resource that could be developed to increase household incomes. A village chicken project was therefore initiated and implemented in Rakai district by Community Integrated Development Initiatives (CIDI), a non-government organisation, in collaboration with several stakeholders, between 2003 and 2005. The overall objective was to contribute to alleviate poverty among subsistence farmers, especially women.

Methodology

The project targeted 400 resource-poor households as the initial beneficiaries. These included four households headed by orphans, two orphanages, 50 female-headed households (most of them widows), 250 housewives and 94 men. The main beneficiaries were women (60%), in recognition of the significant role they play in food-production enterprises. CIDI's approach for technology dissemination was group-based. The technologies are disseminated to farmers through groups because of their multiplier effect. The beneficiaries were organised into 20 groups, with an average of 20 members per group, as the initial beneficiaries of the project. Each member represented a household. The project thus directly reached 400 households in the two sub-counties of Ddwaniro and Lwanda. Workshops were conducted to build the capacity of groups to manage the chicken project. The farmers were trained in poultry management practices such as disease control, feeding and the deep litter system of rearing chickens. They were also trained in how to synchronise hatching of chicks, using broody hens, since the cost of artificial incubation is prohibitive. Uncontrolled natural incubation results in clutches of various ages, with consequent complications in management.

Under a synchronised hatching system, eggs are collected from nests each day and stored in egg trays until required for incubation. When hens start becoming broody, each broody hen is allowed to sit on an egg until others also become broody. After accumulating a sufficient number of broody hens, the eggs that hens have been sitting on are removed and each hen is given 12–15 eggs, depending on the number and the age of the collected eggs. Eggs that are more than 10 days old are not suitable for setting. Thus, eggs are set at the same time, ensuring synchronised hatching. This gives rise to many chicks that are of the same age (Figure 1), which makes the implementation of management and vaccination programs easier.

Figure 1. Thirty five chicks hatched on the same day, by three hens
Photo: Dr Connie Kyarisiima

Each group was provided with 20 well-selected local village hens and two Bovan cockerels for cross-breeding. This cross produced F_1 offspring, which in turn were crossed with commercial broiler cocks to produce F_2 offspring. The initial beneficiaries passed on chickens to other needy farmers. In line with the government's policy of not providing handouts to farmers, the project costs were shared between CIDI and the communities. CIDI met 80% of the project costs while farmers contributed 20%. This developed a sense of ownership in the beneficiaries. CIDI field staff made regular field visits to provide, as well as training, services such as vaccination, and advice and guidance on record keeping. All chickens in the project area were vaccinated against Newcastle disease, using a live vaccine (La Sota strain $\geq 10^{6.5}$ EID_{50}). Group leaders were further trained in poultry management and were charged with the responsibility of overseeing the project chickens in their local communities. They served as community-based trainers (CBTs), reaching out to farmers who were not attached to the project. An evaluation was conducted at the end of the 2-year project period.

Achievements

By the end of the 2 years, the project had made significant impacts. Records showed that the initial beneficiaries had hatched between 1,000 chicks (e.g. Kyosimba Onaanya group) and 2,000 chicks (Gakuweebwa Munno group). All the 400 households that were targeted by the project as direct beneficiaries had already been covered. Farmers had also recorded very good hatchability rates (68–87%) with synchronised hatching. Some farmers, mostly CBTs, had already hatched chicks for more than five cycles and performed comparatively better than the average for their areas. Vincent Ssemujju, a CBT of Luteebe village (Tukolerere Wamu group), for example, had so far hatched 2,000 chicks. He had an estimated annual income of 1.8 million Ugandan shillings (equivalent to about US$1,200) from chicken and egg sales. As a CBT, Ssemujju had transferred the technology of synchronised hatching to 12 other farmers in his village.

Owing to the widespread adoption of synchronised hatching and improved poultry husbandry practices, both egg and chicken sales had significantly increased in the project area. Some households reported annual sales of approximately 200 trays of fertile eggs at a price that is twice as much as commercial table eggs, 200 chicks at 1–2 months of age and 30 adult birds in a year. The cost of an adult improved chicken was more than twice that of a commercial broiler chicken, because the former was said to taste better than the latter. During one of the visits, George William Jjumba of Tulembeke Orphans' Care Group boasted that a person growing beans could not compare with him because such a farmer could not sell anything during such dry months. He reported that the whole cycle had reached over 2,000 birds since joining the project in October 2003. Generally, chicken production in the area was high. The district veterinary officer remarked that records at the livestock checkpoints showed increased chicken trafficking across the borders of Rakai district into neighbouring districts. He attributed this increased chicken production to the CIDI chicken project. Farmers appreciated the practice of record keeping because it enabled them to track their income and expenditure, as well as the turnover of their chicken flocks. Many of the farmers who were still having difficulty in using the formatted record sheets had resorted to the use of exercise books. Most of the farmers had not completed even primary-school education.

Orphan-headed households that participated in the project had benefited from their poultry enterprises. For example, Isaac Sserwanga of Ddwaniro subcounty, whose parents died in 1998 leaving him and his three siblings in a makeshift grass thatched house, had so far constructed a three-bedroom, brick-and-mud, iron-roofed house. He was able to pay school dues for his three siblings who were still in primary school. The manure generated in the chicken houses had increased his pineapple and banana yields to the extent that he could now sell bunches of bananas instead of loose banana fingers.

Household nutrition had also improved remarkably, not only for the participating households but also in the whole community. The participating farmers reported that their family members ate an egg at least three times a week, and some families had a menu consisting of a chicken every Sunday. Marked improvements were noted in housing conditions, family incomes, payment of school fees and purchase of scholastic materials for children.

One of the outputs of the project was the formation of a Chicken Breeders' Association (The Rakai Local Chicken Breeders' Association (RALOCBA)) that would help in marketing of birds as well as ensuring supplies of feed. The association

now operates a feed-supply centre in Lwanda township. The centre sells feeds and drugs to the farmers, besides offering free technical advice to them. The centre also serves as a marketing outlet for farmers for a small service fee. The association is expected to supervise the chicken breeding program in the whole district.

Challenges to the project

The following are the main challenges and problems faced by the project:

- The cost of feeds for the birds was a big problem to the farmers because of the increased flock turnover resulting from the adoption of the synchronised hatching technology.
- There was a serious problem of scarcity of water in the project area, especially during dry seasons. Much of the available water sources have very poor-quality water that is not suitable for either humans or livestock.
- Some farmers, especially those afflicted with HIV/AIDS, had poor health. Two of the households benefiting from the CIDI chicken project had lost members due to HIV/AIDS. One of the members lost his wife and he, too, was bedridden for several months and his chicken project collapsed.
- There were outbreaks of diseases such as fowl pox and fowl typhoid.

Key lessons

The key lessons learnt from the project were that:

- the group approach is cost effective since most of the training is done at group level—even synchronised hatching can be organised at group level
- synchronised hatching of chicks increases flock turnover in village chickens
- synchronised hatching makes administration of vaccination programs in rural areas easier
- vaccination campaigns should cover other common diseases such as fowl pox, fowl typhoid and infectious bronchitis.

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References

Haslwimmer M. 1994. Is HIV/AIDS a threat to livestock production? An example of Rakai, Uganda. FAO World Animal Review 1994, 3–4. Food and Agriculture Organization of the United Nations: Rome.

Hunter S., Bulirwa E. and Kisseka E. 1993. AIDS and agricultural production: a report of a land utilization survey, Masaka and Rakai districts of Uganda.

UBOS (Uganda Bureau of Statistics) 2002. Statistical survey 2002. At: <www.ubos.org/>.

The efficacy of a thermostable Newcastle disease vaccine in village chickens when administered by community volunteers: a South African experience

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Abstract

Initial work done on the vaccination of village chickens in the communal areas of South Africa demonstrated that the Nobilis Inkukhu® commercial thermostable vaccine was able to protect chickens against virulent Newcastle disease challenge when applied by eye-drop, in water or in feed (cooked maize meal). In the initial trial work, all vaccines were prepared by university staff or graduate students, rather than poultry owners themselves. In order for vaccination of the village chickens to be carried out on a more extensive scale, it is obviously necessary for a larger body of people to be enabled to vaccinate chickens. It was also felt by the researchers that once community members had to make an effort to get their chickens vaccinated, it would be possible to determine somewhat more accurately what was the real level of enthusiasm for vaccination of chickens among the community.

The trial work was carried out in the village of Disaneng which lies in the Northwest province of South Africa. Visual and practical training material was prepared and presented to community-elected and volunteer 'vaccinators'. Vaccinators were then required to register all the poultry owners in their ward who wished to have their chickens vaccinated. Once an indication of the number of chickens to be vaccinated had been made available, Inkukhu vaccine was supplied to vaccinators free of charge. Vaccinators were responsible for the organisation of the vaccination campaign, including the storage and preparation of the vaccine for application. Vaccine application methods differed between wards.

All nine wards in the village were initially involved in the vaccination campaign, with a total of 482 households owning 6,141 chickens participating. Detailed survey work carried out in three of the participating wards indicated that this represented slightly more than 60% of the chickens in the area. Involvement in a second round of vaccinations, 1 month later, was far poorer, with only 211 households owning a total of 1,636 chickens participating.

Approximately 1 month after each vaccination campaign, blood samples were collected from a random sample of about 150 chickens that had been vaccinated and tested for circulating antibodies to Newcastle disease, using the haemagglutination inhibition test. These results showed variable levels of protection achieved, but were influenced more by the area (vaccinator) from which they came, than the vaccine application method used.

Work is planned for July 2005 to investigate the reason for the sudden drop-off in community participation between vaccination campaigns as well as to obtain further information about vaccine handling and preparation by the community vaccinators.

Another unexpected finding was the rate at which chicken flock numbers appeared to alter between vaccination campaigns. The reason for this has yet to be established, but the fluctuations may indicate that chickens are moved between homesteads belonging to a single family, depending on what forage is available. Another possible explanation is unidentified disease problems.

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Contribution to set up a strategy to develop guineafowl farming in Sahelian Africa as part of the fight against poverty

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Abstract

This note aims at giving the first results of the implementation of the strategy for the promotion of guineafowl farming in Sahelian Africa started as part of the Special Programme for Food Security launched in 1996 by the Director-General of the Food and Agriculture Organization of the United Nations (FAO) for low-income countries suffering from chronic food deficit.

The strategy used is based on a technically, economically and ecologically viable micro-project approach. These projects produce a minimum income of about US$30.00 per month for a US$400–500 investment. Above all, this approach is about promoting local know-how by helping the Sahelian populations to make the most of the assets they have, particularly a long tradition of raising guineafowl and an exceptional adaptation of the birds' biology to the ecological context of the countries involved, in this case Chad, Niger, Mali and Burkina Faso.

The first results, evaluated on the basis of three criteria—sustainability of the activity, increase in income and an actual increase in the growth rate of the bird population—confirm the viability of this strategy and show a real trend of the beneficiaries to self-finance all expenses necessary to improve the productivity of their bird farming.

Constraints, however, persist: there is a particular weakness relating to the growth rate of the bird population, the root causes of which lie in inadequate technical training of beneficiaries in raising young guineafowl, inadequate practical technical skills of extensionists, and the wrong choice of beneficiaries by the village community. It is important to correct these deficiencies and to promote guineafowl-raising development goals in order to create jobs and establish guineafowl raising as an important lever for the development of Sahelian countries.

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Enhancing food security in villages by improvement of local chickens

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Abstract

A 3-year program to improve Mkuranga food security through sustainable agriculture was financed and implemented by Vrebeseilanden Country Office, Tanzania, in collaboration with the Tanzania Association of Women Leaders in Agriculture and Environment. Improvement of local chicken production was one of the project components. Farmers were selected to implement the program from three villages: Sotele, Mwanambaya and Mwanadilatu.

The project has enhanced food security through increased productivity of village chickens and has raised incomes and nutrition levels of farm families.

The program to improve local chicken production involved:

- on-farm training of farmers on chicken management,
- distribution of purebred cockerels for upgrading the local chicken flocks
- disease control
- monitoring and evaluation.

Two hundred and ninety-six farmers were trained on poultry management (housing, nutrition, disease control and marketing).

Two hundred dual-purpose purebred Rhode Island Red poultry were distributed to farmers in the three collaborating villages, on the agreement that each farmer receiving a purebred cockerel would contribute to other farmers two of the offspring it sired.

Newcastle disease (ND) is the greatest impediment to the production of the village chickens, and has been reported to cause over 90% mortality. In choosing a vaccine for use in the village situation, previous findings about the ability of farmers to apply ND vaccine were considered by facilitators. Between January and June 2005, 2,058 chickens were routinely vaccinated against ND at Mwanambaya, 2,081 at Mwanadilatu and 1,600 at Sotele villages.

Promising growth performance and quick adaptability to local conditions of the introduced cockerels and hatched chicks were observed. However, poultry thefts discouraged farmers from expanding their poultry units. Nevertheless, it is expected local chicken egg production and size will improve and contribute to alleviation of poverty among village families as planned in Tanzania's National Strategies for Growth and Poverty Reduction.

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Collaborative approaches in Newcastle disease control in Malawi

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Abstract

Collaborative arrangements were initiated by the Department of Animal Health and Livestock Development of Malawi with four non-government organisations (NGO) to enhance the implementation of poultry-related activities and control of Newcastle disease (ND) in village chickens. Collaboration was established in two different ways: through negotiation with the Southern Africa Newcastle Disease Control Project and voluntarily. The voluntary collaborative arrangement proved successful, with collaborating NGOs contributing resources towards the implementation of ND control activities. In contrast, negotiated collaboration did not result in the NGOs fully committing themselves to the implementation of a ND control program.

A memorandum of understanding to bring stakeholders together to systematically solve existing and emerging problems in the fight against ND in village chickens in rural areas was drafted. It was ratified jointly with NGOs and other stakeholders to ensure that there was common understanding of the coordination mechanism. The NGOs that voluntarily opened collaboration with the Department of Animal Health and Livestock Development directorate showed more willingness to formalise the collaborative arrangement than did NGOs that were brought on board through negotiation. The former group trained more community vaccinators and vaccinated more chickens during the campaigns than did the latter.

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The key role of Newcastle disease control in the activities of women's groups in Chalinze village, Tanzania

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Abstract

Poultry raising is an important activity for the people of Chalinze village, particularly for the women, who are the main poultry owners. Of the 1,142 households in the village, around 85% keep poultry, mainly chickens, which find a ready market at the nearby trading centre located on the main highway from Dar es Salaam. Money derived from the sale of chickens is used for such things as paying school fees and for medical services, and even for house construction. Chickens are also used as food, gifts for visitors and in traditional healing.

Poultry keeping in the area faces a number of constraints. One of the most important of these is Newcastle disease (ND). When, in 1999, the women realised the importance of ND, they formed groups and tackled the problem with the assistance of the local extension officer. La Sota vaccine was initially used to control ND, but I-2 ND vaccine was introduced in 2004, since it offers the advantage of thermotolerance. In vaccinated flocks, the mortality due to ND has fallen from around 85% to only 5%.

There are four women's groups in Chalinze village, with a total membership of 95. The women raise chickens, guineafowl and ducks, and keep detailed records of production, vaccination, marketing and prices, training, and research activities in pilot units. Sales of guineafowl and chickens provide an important contribution to family income. This paper describes the composition, role and activities of the women's groups in Chalinze and the key role that poultry raising and ND control have played.

Introduction

Chalinze village is located in the central zone of Tanzania, around 60 km from Dodoma, the political capital. It is one of 128 villages administered by Dodoma Rural District Council. There are around 1,142 households in the village, which has a total population of 4,155. Agriculture is the mainstay of the community. Vegetables, maize, sorghum, pearl millet and sesame are cultivated for food, and sunflower and groundnuts as cash crops. Livestock raising is also an important activity. Other income-generating activities are salt making and handicrafts.

Women are the main poultry keepers in Chalinze. Around 85% of households keep chickens, which are used as food, in traditional healing and as gifts for visitors. Funds from the sale of chickens supplement household income and are used to pay for house construction, school fees and medical services. Poultry keeping in the area faces a number

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of constraints, one of the most important being Newcastle disease (ND). In 1999, when the women realised the importance of ND, they formed groups and tackled the problem with the assistance of the local extension officer. La Sota vaccine was initially used to control ND, but I-2 ND vaccine was introduced in 2004, since it offers the advantage of thermotolerance. Since vaccination was introduced, the mortality due to ND in vaccinated flocks has fallen from around 85% to only 5%.

Group composition and organisation

As the main poultry owners, women in Chalinze were quick to recognise the impact that ND was having on their flocks. Since their flocks were small, they found it difficult and expensive to purchase vaccine individually. In 1999, they decided to form groups to tackle the problem jointly, under the supervision of the local extension officer.

There are four women's groups in Chalinze village with a total of 95 members. The groups, together with groups in the adjacent villages of Wilunze and Manchali, are clustered into the DIRA association. The DIRA is led by a coordinator whose role is to harmonise all the activities of the groups and to collect information from them. Each group has, in addition to a coordinator, a facilitator, assistant facilitator, chairperson, secretary and group mobiliser.

The main activity of the groups is poultry raising. Other activities are salt making, gardening, sorghum seed production, handicrafts, housekeeping and childcare. The women have also formed a drama group.

Poultry raising

Chickens, guineafowl and ducks are the main poultry species kept in the area. The chickens are free range. They scavenge during the day but are locked in the owner's house at night. A few members have small houses for their chickens and other birds. Supplementary feed—for example, maize, bran, millet and sorghum—is offered when it is available and clean drinking water is provided. The 'average' flock consists of 20–30 chickens and 30–80 guineafowl. Since the guineafowl fetch higher prices at the market than chickens, the chickens are used to hatch guineafowl eggs and rear the chicks. Ducks are not common, since they fetch low prices at the market. A trial is being conducted using ducks to hatch guineafowl eggs, thereby allowing hatching twice in one laying period. Groups keep records of the average prices of chickens and guineafowl, and of details of vaccinations, training and trials in pilot units.

Chicken owners have a ready and reliable market for their birds, and prices are good. The chicken trading centre located along the main road is recognised as a major source of poultry by chicken traders. Traders sometimes go house to house to buy chickens or buy chickens at the trading centre. Birds are then on-sold to people travelling to Dar es Salaam and Morogoro, or are sent to Dar es Salaam.

Newcastle disease control

Chicken mortality due to ND is a problem in the area. When the women realised the impact that ND was having on their flocks they sought assistance from their extension officer, asking him to find a solution. The district office advised vaccination. Initially, La Sota vaccine was used to control ND, but I-2 ND vaccine was introduced in 2004, since it offers the advantage of thermotolerance. Farmers vaccinate three times a year, in April, August and December, to ensure that flocks are protected from ND all year round. The group coordinators and leaders are responsible for vaccination within the groups and work under the supervision of the chief coordinator of DIRA and the extension officer.

The vaccine is purchased from the district office with funds contributed by the members. In the village it is kept under a water pot until it is used. There is no refrigeration. Since I-2 ND vaccine was introduced in 2004, the groups have vaccinated five times (May 2004–August 2005). If other people in the area wish to have their chickens vaccinated, the cost is TSh30 (around US$0.03) per chicken.

Training

Training is recognised as an essential element in the work of the women's groups. Three group coordinators have undertaken training in development and leadership, and a number of group members were also trained in crop and livestock husbandry. Training was by distance education in all these cases, and the women were self-funded.

Fifty-eight group members were trained in ND control by the district officer responsible for ND control, using materials prepared by the Southern

Africa Newcastle Disease Control Project (SANDCP) drawing on information in Alders et al. (2002). One member attended a 3-day training course on poultry husbandry and ND control sponsored by SANDCP in 2005. The extension officer also participated in a SANDCP 3-day training course in ND control for extension officers.

Achievements

ND regularly killed about 85% of the poultry population in the village before vaccination was introduced. Little benefit was realised from the women's poultry due to the regular devastation of the flocks. Although the disease is still a problem in unvaccinated flocks, mortality due to ND has fallen to around 5% in vaccinating households. These deaths are attributed to introduction, into vaccinated flocks, of unprotected chickens from non-vaccinating areas.

Proceeds from the sale of chickens and guinea-fowl make a significant contribution to household income. For example, one group member is paying the fees for her child to study at the local vocational training institute, while another is building a house using the proceeds from the sale of her chickens.

The women's groups were instrumental in helping to organise activities to mark World Rural Women's Day in October 2004. It was the first time that the day had been celebrated in the area. To honour the important contribution that women make to rural life and development, training was held in ND control, women's rights on land tenure, HIV/AIDS and malaria.

Plans for the future

Widows and orphans will be included in the groups' future program, so that the nutritional status and income of these most vulnerable members of the community will be improved. Vaccination campaigns will also be extended to all households (and chickens) in the village.

Following the successful celebrations held in 2004, the groups plan to celebrate World Rural Women's Day 2005 with further training in ND control, women's rights on land tenure, the effects of female genital mutilation, the effects of malaria and in reducing the numbers of deaths of children under 5 years of age.

Conclusion

The recognition of the benefits that can be derived from poultry, and the need for effective control of ND, were the stimulus for the formation of women's groups in Chalinze. Poultry raising has become an important income-generating activity in households of group members since effective control of ND through vaccination was introduced.

References

Alders R., dos Anjos F., Bagnol B., Fumo A., Mata B. and Young M. 2002. Controlling Newcastle disease in village chickens: a training manual. ACIAR Monograph No. 87.

Field-based poultry schools for poor, illiterate farmers in Kenya: lessons learnt from a pilot project

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Abstract

In 2002, the Danish International development Agency and the Government of Kenya launched an initiative to use smallholder poultry development as one tool for poverty alleviation. The initiative is linked to the Micro Enterprise Development Project (MEDP) and the Micro Finance Institution Initiative (MFII) under the overall Agricultural Support Project (ASP). To initiate the pilot project, a stakeholder workshop was prepared by the poultry network and the ASP. The workshop explored the possibilities of family poultry production projects in relation to the national strategies for poverty alleviation and food security. The aim was to effectively assist decision-makers in government, non-government organisations and donor organisations to optimise the impact of projects through technical training, social organisation and the use of credit schemes. A pilot project based on the workshop was subsequently initiated in 12 villages in Taita Taveta and Kwale districts in 2003.

The lessons learnt from the pilot project in ASP are that many village women, be they poor or better off, see local poultry as having good potential for income generation, as well as for enhancing social status and credibility in the local communities. A smallholder poultry farmer field school (FFS) from egg to egg scheduled to run for 7 months was almost complete in April 2005. The fertile eggs that started the cycle produced pullets ready to lay.

The original philosophy was to keep the technical inputs as simple and adaptable as possible. A field visit in April showed that all women involved have now accepted a few important technical tools that were first introduced during the model phases: the use of baskets to confine young chicks, feeding for confined young birds, and vaccinations. From the meetings and individual visits to FFS members, it is noted that the FFS has empowered women and their villages with knowledge and techniques to reduce chick mortality and improve the growth rates of local birds. The women have seen the gains of involvement in a learning program, and they have successfully raised and sold a few birds. Non-FFS members are interested, wishing they had joined the first farmer field school.

Investigations during initial formulation show no major constraints to the marketing of local poultry products. In general, farmers can sell their poultry products right at the doorstep. However, the development of smallholder poultry production takes time, and members in the FFS have only recently started to sell their products.

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According to the FFS members interviewed, chicken mortality during the first 3 months has generally decreased from 60–80% annually to 20%. In addition, the average weight of birds has increased, making it possible to sell birds weighing 1 kg as early as 4 months of age.

During the field visits, it was observed that different FFSs are approaching Microfinance Institutions (MFIs) differently. The most commonly used approach in Kwale is 'merry go round'. Some FFS are specifically doing merry go rounds to collectively buy starter feed for chicks. MFI credits were not found useful for the poor farmers to invest in poultry. FFS farmers in Kwale have gone through learning by discovery, whereby they identified marketing birds at a certain age as a coping strategy before shocks hit their production systems.

Findings strongly support the move from the original 'top-down' model approach to a more open-learning approach. The model approach was a scientifically sound approach, but had at least three major flaws: 1. it was expensive and time consuming to implement; 2. it did not question underlying assumptions, such as the use of micro-credit; and 3. it included the distribution of free inputs to farmers during the initial phases. The FFS approach seems to be less expensive and quicker and, more importantly, the testing and decisions on different solutions are made by the farmers in collaboration with extension staff, with no free inputs to the farmers, apart from subsidised training.

The lessons learnt so far are that a relatively slow, two-step training approach with a training of trainers or training of facilitators course for extension staff, and a farmer field school for the farmers, are necessary to change attitudes and improve the skills of extension staff (to become facilitators) and farmers.

Village chickens helping to keep the children off the streets in peri-urban Dar es Salaam: the Mama Mkubwa project

Adeodartha Lupindu[1], Nancy Macha[2], Mary Young[3], Robyn G. Alders[3] and Celia Grenning[4]

Abstract

The Mama Mkubwa ('respected elder aunts') ensure that orphaned, runaway or abandoned children in their communities are cared for within families. Local women volunteers, the Mama Mkubwa are advocates for the children in their local neighbourhoods, and ensure that they go to school, at least until primary schooling is completed, and are not abused. One constant concern of the Mama Mkubwa is how to feed the children: 'How can they study if they are hungry? They need food'.

The KYEEMA Foundation is helping these women to set up small chicken-raising enterprises so that they can earn a small income to buy food and other necessities for the children in their care. Ten Mama Mkubwa are being trained to rear local chickens and have been provided with small foundation flocks and other materials needed to ensure the health of the chickens. In addition, several of the women have been trained as community vaccinators and are planning their first vaccination campaign against Newcastle disease in their local community.

Introduction

The Tuamoyo Family Children's Centre is a community-based organisation that aims to be an outreach to runaway, orphaned or abandoned children. It assists children in meeting their basic needs, helps them to develop skills needed to reintegrate into the community and offers them friendship, enabling them to cultivate self-respect and to feel valued as people. The centre works with local councils, schools, medical facilities and volunteers to ensure the welfare of the children.

The Mama Mkubwa ('respected elder aunts') program was set up to look after orphaned and street children in the homes of women volunteers. They are advocates for the children in their local neighbourhoods, making sure they go to school at least until primary level education is completed, and are not abused. The Mama Mkubwa are trained in how to talk with the children and how to begin income-generating projects that can assist in raising much-needed money to provide food for the children.

One such project is supported by the GRM International Development Fund. The fund is administered by the KYEEMA Foundation and is helping the Mama Mkubwa to set up small chicken-raising enterprises so that they can earn a small income to buy food and other necessities for the children in their care.

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Community description

The Tuamoyo Family Children's Centre is located in Kigamboni, in the Temeke district of Dar es Salaam. The area is best described as peri-urban, being only a short ferry ride from the centre of the city. Due to poverty, illness and family breakdown, there are many runaway, orphaned or abandoned children in the area.

Many households in the area keep livestock, mostly poultry (chickens, ducks and guineafowl), but sometimes cattle. Chickens have multiple roles in the community. They are used as medicine, as dowry in some areas, in payment of fines in local disputes and as 'fast food' in emergencies. Since they are easier to sell than any other livestock species, chickens are a particularly important source of income for women, and are a good source of food, especially their eggs, which are very rich in protein.

Training activities

To facilitate easy communication with the Mama Mkubwa and encourage learning, the trainer selected was a female livestock officer with good interpersonal and language skills. The trainer had participated in a training of trainers course designed and conducted by the Southern Africa Newcastle Disease Control Project (SANDCP) for those involved in the training of community vaccinators.

A training program was developed, based on models developed by SANDCP and the International Rural Poultry Centre. It includes modules on

- Newcastle disease (ND) and its control
- nutrition and feeding of chickens (and of people)
- chicken housing and shelter
- chicken reproduction
- marketing
- conducting vaccination campaigns
- evaluating campaigns.

The schedule and timetable of activities were discussed with the Mama Mkubwa to ensure that training was conducted at times best suited to their home and project activities. The venue selected for the training was the headquarters for the Tuamoyo Outreach Program in Kigamboni. This ensured that all women could participate easily and that chickens were available for practical sessions throughout the course. Although many other community members expressed interest in joining the training course, the group size was limited to 12, comprising the 10 Mama Mkubwa and 2 other women directly involved in the project.

The module on ND and its control was based on the training course for community vaccinators designed by SANDCP. It extended over 3 days. SANDCP training materials and methods (SANDCP 2004) were used. The module consisted of discussion and practical sessions, and ample time was made available for the women to practise the skills involved in handling chickens and administering vaccine as often as possible. They were also encouraged to make short presentations to the group on topics covered on the previous day.

On the first day of training, the women participated in exercises to raise awareness of the importance of village chickens, to exchange experiences in chicken raising and to introduce the idea that small improvements in the husbandry of village chickens can make significant differences in productivity. The module also covered the characteristics of healthy and sick chickens, signs of ND, treatment of ND, how ND spreads, control of diseases including ND, vaccines, and vaccination of chickens against ND using I-2 ND vaccine. Specific training on how to organise and conduct vaccination campaigns was covered in a subsequent 1-day training course for community vaccinators.

Nutrition and feeding, and housing and shelter, were introduced during a 1-day training course. This was done so that the Mama Mkubwa could consider their individual home environments and resources, and plan for the small foundation flocks to be provided by the project. A further day of training in these topics was planned later in the year when the discussions about feeding and nutrition would also be used to discuss the components of a balanced diet for human families.

Modules on reproduction and marketing will follow once the flocks are well established.

Foundation flocks

Some Mama Mkubwa already had small flocks of village chickens and these women were key group members, sharing their knowledge and experience with the others. The project provided a small flock of four hens and one cockerel to each Mama Mkubwa. Although the women were initially interested in commercial chickens because of their perception of better productivity, village chickens were selected due to the lower cost of inputs required.

Chickens were purchased locally and quarantined for 1 week before distribution. During this time they were observed daily and vaccinated against ND using I-2 ND vaccine.

Vaccination campaigns

During the training in ND and ND control, it became apparent that ND is endemic in the area. The disease is well known and outbreaks occur mainly from April to June each year, with peaks of the disease in May.

Several of the women have been trained as community vaccinators and are planning to help their community and earn a small income through conducting vaccination campaigns against ND. The project was discussed with the district veterinary officer for Temeke district and he is keen to see vaccination campaigns conducted in the area, under the supervision of the local extension officer. Campaigns will be conducted three times a year following the schedule recommended by the Department of Veterinary Services. Monitoring and evaluation will be carried out after each campaign to help the vaccinators and their supervisor to identify and overcome problems that may have occurred. The women were planning their first vaccination campaign for January 2006.

Future plans

The women plan to set up a chicken revolving fund so that other disadvantaged and vulnerable families can also benefit from the project. During the community awareness raising activities planned before the first vaccination campaign, the women would be able to use their new knowledge to inform others in the community, particularly women, of ND and the importance of ND control.

Acknowledgments

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Reference

Southern Africa Newcastle Disease Control Project Tanzania 2004. Controlling Newcastle disease in village chickens. A training manual for trainers of community vaccinators.

Avian influenza in smallholder chicken flocks

Paul Gilchrist[1]

Abstract

Avian influenza virus occurs in a number of forms, some of which produce severe disease in chickens and turkeys. A recent outbreak in Asia is caused by a type of the virus that also affects other birds and humans. This virus has become endemic in some countries, and smallholder chickens and ducks may be hiding the virus and spreading it to commercial poultry and humans. With cases reported in a number of Asian countries, there is a risk that it may spread to other regions. A major danger for smallholder farmers is that forms with low pathogenicity may spread unnoticed and then mutate to highly pathogenic forms causing serious disease. Many cases of the disease have occurred in smallholder units in Asia and could well be a problem in other countries as it spreads.

The tools used to prevent and control avian influenza are:

- education—awareness raising and disease recognition
- biosecurity—isolation from infected and recovered poultry, wild birds, live-poultry markets, fomites (especially manure)
- early recognition—monitoring and diagnosis
- unofficial measures—voluntary quarantine
- official measures—diagnosis and stamping out (quarantine, slaughter, disposal and clean-up)
- vaccination—inactivated, recombinant, molecular and subunit vaccines.

The significance of these approaches for smallholder farmers is discussed.

Introduction

Avian influenza (AI) is caused by the avian influenza virus (AIV). This virus has long been known as the cause of severe disease (formerly called fowl plague) in chickens and turkeys. The virus also infects other domestic and wild birds, usually without producing signs. Wild birds, particularly waterfowl and including ducks, may become infected and carry the virus. (Gilchrist 2005). The virus is usually considered to be non-pathogenic to ducks (Selleck et al. 1994). The most commonly infected free-flying wild birds are waterbirds (ducks and geese) and waders. The recent outbreak in Asia has also caused disease and deaths in ducks, free-flying wild birds and humans (Li et al. 2004) and a severe outbreak has been identified in migratory waterfowl in western China (Liu et al. 2005).

Avian influenza viruses isolated from chickens vary in pathogenicity and have, in the past, been grouped into mild pathogenicity (MPAI) and highly pathogenic (HPAI) types (Swayne and Halvorson 2003). More recently, however, the practice has been to describe all viruses that are not HPAI as low pathogenicity (LPAI) viruses (Alexander 2003).

The history of avian influenza and its control are well summarised in a review article by Swayne and Suarez (2000). The Asian outbreak is discussed in a more recent article (Anon. 2004).

The avian influenza viruses are classified into H and N groups based on their surface antigen structure with haemagglutin (H) and neuraminidase

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(N) being the defining components of the groups. There are 15 H groups and 9 N groups. Most combinations of these groups have been found in domestic and wild birds, but only H5 and H7 types have been found in cases of severe avian disease. All the other H types (H1-4, H6 and H8-15) are of low pathogenicity for birds.

Within the H5 and H7 groups, most isolates are of low pathogenicity, but adaptation to chickens can lead to mutation from low to high, leading to some concern that spread of mild forms may be relevant to eradication methods (Alexander 2003). In addition, mutation to a form infective to humans has occurred in the H5 type in Asia, where H5N1 is the cause of the Asian influenza outbreak. This virus has become endemic in some countries, and smallholder chickens and ducks may be hiding the virus and spreading it to commercial poultry and humans.

There is a particular danger of genetic change in AI viruses from passage through pigs. If pigs are kept in close contact with infected poultry, the virus may infect pigs and undergo recombination with influenza viruses in the pigs. The chance of such viruses being a cause of serious disease in humans is thereby increased (Horimoto and Kawaoka 2001).

Low-pathogenicity viruses occur in wild birds (Mackenzie 1988; Easterday et al. 1997) and are maintained in wild aquatic bird reservoirs, occasionally crossing over to domestic poultry and causing outbreaks of mild disease (Halvorson 2002). High-pathogenicity viruses do not have a recognised wild bird reservoir, but can occasionally be isolated from wild birds during outbreaks in domestic poultry.

The accepted methods for dealing with HPAI viruses are prevention of exposure to the virus and eradication. Control programs that allow a low incidence of infection are not an acceptable method for managing outbreaks of severe disease but have been used during some outbreaks of mild disease. Vaccination has been used in control and eradication programs for some LPAI viruses (Swayne and Suarez 2000).

The H5N1 Asian AI outbreak appears to have different characteristics from earlier outbreaks and has involved some wild and domesticated waterbirds (Li et al. 2004).

A global strategy has been developed by the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (OIE) and the World Health Organization (WHO) (Anon. 2005a). This strategy includes recognition of the exposure of smallholder farmers to the ravages of the disease and their lack of resources to counter it. The strategy will include:

- improving animal health services at village level by means of organising community-based early warning networks, utilising the existing pool of para-veterinary village workers
- increasing farmers' general awareness through simple biosecurity guidelines on AI control using publications in local languages
- providing access to credit or microfinance as a tool for rehabilitation as an alternative to direct compensation, which some countries may not be able to afford
- developing farmers' groups and/or associations to help improve awareness and dissemination of information.

The involvement of private-sector organisations in assisting smallholders should not be overlooked, as the control of the disease in smallholder operations may be essential to protection of commercial poultry organisations.

Large populations of birds make a big target for viruses. Small farms offer a lesser target but can still become infected. Small farms may hide the virus between outbreaks or spread it between commercial farms during an outbreak. Live-bird markets, semi-feral poultry and fighting cocks may all be involved in virus spread. Placing susceptible birds in contact with other birds that may be infected, then returning them to the home unit increases the risk of infection being introduced. Many countries with smallholder chicken flocks held in villages have become, in effect, covered by a thin carpet of semi-feral village chickens.

Fighting cocks are of particular concern in causing human infection because of the intimate level of contact that may occur between humans and these valuable birds. There are anecdotal accounts of fighting cocks that appear to have been injured in a fight, being treated by the owner sucking on the bird's nasal passages to remove sinus secretions. If such a bird were infected with HPAI it is obvious that the risk of human infection is high.

The prevention and control of AI can be achieved by the following methods:

- education—awareness raising and disease recognition

[2] Sixteen H groups are now recognised.

- biosecurity—isolation from infected and recovered poultry, wild birds, live-poultry markets and fomites (especially manure)
- early recognition—monitoring and diagnosis
- unofficial measures—voluntary quarantine
- official measures—diagnosis and stamping out (quarantine, slaughter, disposal and clean-up)
- vaccination—inactivated, recombinant, molecular and subunit vaccines.

A discussion of each of these follows.

Education

Awareness raising and disease recognition are crucial. AI has been a rare occurrence until the recent Asian epidemic and may not be either recognised or considered important in many countries. Awareness raising and disease recognition may be issues in such areas. The severity of signs may vary and the implications for the owner of affected, or even merely exposed, birds are serious, and many producers may be fearful of the consequences of admitting that the disease may have occurred. Attempts at hiding the disease may facilitate its spread.

Education strategies should include awareness raising through mass media, school and community programs (in youth and women's organisations) and involving local technical people in surveillance and training activities.

Educational strategies are discussed in Anon. (2005b).

Biosecurity

Healthy chickens must be isolated from infected and recovered poultry, from wild birds, from live-poultry markets and from fomites (especially manure).

Poultry farming systems may be classified into four levels of biosecurity along the lines of the sectors proposed by FAO (Anon. 2004):

- Sector 1. High biosecurity industrial integrated systems
- Sector 2. Moderate to high biosecurity commercial systems
- Sector 3. Low to minimal biosecurity commercial systems
- Sector 4. Minimal biosecurity village or backyard systems.

It is the fourth sector type that is the subject of this paper. The relevance of the comparison between these systems is to emphasise the high level of exposure to the virus that may occur in smallholder poultry systems. The impact of an incursion of the virus on sector 1 or 2 may be much worse, because of the high number of birds involved and because the opportunity for a large number of virus multiplications in a short time is much higher. This high number of rapid multiplications favours the development of genetic change, including the possible change from low to high pathogenicity.

While smallholder chicken-farming operations have lower numbers of susceptible birds exposed to the virus, they still offer an opportunity for LPAI viruses to mutate to HPAI forms by passage through chickens. This is especially a concern because LPAI forms may not cause sufficient signs of disease to allow them to be recognised.

The smallholder operations may be physically more exposed to domestic or wild birds carrying the virus. Spread to or from neighbouring smallholder units may occur easily.

They are also more likely to be associated with live-bird markets where newly bought or unsold birds that have been exposed to the virus are taken home to an operation where susceptible birds are present. The lower number of birds involved, however, imposes a limit on the number of multiplications that may occur, thus reducing the chance of genetic change occurring and leading to further spread of LPAI.

Equipment used for transporting eggs or birds to or from the market may also be contaminated on return to the unit. People moving between infected and susceptible birds are also possible carriers of virus.

Early recognition

Rigorous monitoring and early diagnosis of diseases are essential. If official eradication procedures are applied as a result of an outbreak in commercial poultry, it is likely that birds on smallholder farms may also be killed off to stop virus spread. The cost of such slaughter may be very serious for a smallholder farmer.

The H5 type may spread from poultry to humans so it is important for all poultry farmers to avoid close contact with infected birds. If the virus becomes established in people there is a very real danger that it could adapt and become a serious human disease.

Signs of AI vary a great deal. The clinical and autopsy signs of the disease vary with the patho-

genicity of the virus, the species affected and its sex, age, concurrent infections and acquired immunity, and environmental factors. LPAI causes a low mortality rate but clinical signs may be common. They may cause depression, loss of production, oedema, necrosis and haemorrhage of the comb and wattles, and respiratory signs including pneumonia, rales, coughing and sneezing.

In chickens and turkeys, HPAI may cause sudden death with no clinical signs. Less severely affected birds may show nervous signs with tremors of the head and neck, weakness or unusual positioning of the head, wings and legs. There may also be some lesions of the comb and wattles. Birds may be depressed, quiet and stop laying.

Diagnosis can be confirmed only by laboratory tests, including antibody, antigen or virus detection. In such a critical disease it is important to have diagnostic facilities available in advance. Recognition of the earliest cases is most important if there is to be any hope of successful eradication. As early cases may be caused by LPAI, the significance of diagnostic facilities becomes even more important. Monitoring by sampling flocks over a wide area is important in establishing a baseline of information to allow evaluation of isolations made in a suspected outbreak.

Differential diagnosis may be important. A number of other diseases may show signs that can be confused with AI. Fowl cholera and Newcastle disease are prominent among these. Other causes of respiratory signs with or without sudden death must also be considered, including laryngotracheitis, coryza and mycoplasmosis. Diseases such as infectious bursal disease or coccidiosis may cause sudden deaths in young birds and, if some respiratory disease is also present, there may be confusion.

The OIE has developed a 'Manual of diagnostic tests and vaccines for terrestrial animals' (Anon. 2005d).

Unofficial measures

Voluntary quarantine may benefit smallholders. The risk for individual smallholders is that the identification of the disease in their flock may lead to loss of face in the community or to slaughter of their poultry by authorities. With H5N1 HPAI there is the additional danger of human infection to consider. Covering up the infection adds to the likelihood of spread to humans.

To protect susceptible birds, smallholders may benefit from the voluntary imposition of quarantine, with complete restriction of the entry of virus from outside the area. There is some point in improving the isolation of their flock by preventing movement of live birds, people, equipment and poultry products into the area.

Once an outbreak occurs in a smallholder flock or area it seems unlikely that eradication will be successful without the persuasive effect of incentives and penalties at an official level. An exceptionally altruistic and well-educated community of smallholders would be needed to expect successful eradication. Smallholder operations normally depend upon the movement of live birds, people, equipment and poultry products. A complete standstill is unlikely to be effective. The spread of disease is unlikely to be controlled unless an all-in, all-out system including a single age of birds in all units in a neighbourhood is applied.

If compensation is not provided, there is a strong incentive to dispose of affected birds as profitably as possible. In many cases, rapid sale of suspect birds would appear attractive and thus further spread of virus could occur. The downside of a compensation scheme is that some producers are encouraged to spread the disease to their flock in order to get access to funds that may not otherwise be available during an outbreak.

Unofficial measures to control an outbreak are likely to be counterproductive. Vaccination is probably the only thing a smallholder can do. The risk of using unauthorised vaccines must be understood and discouraged.

Pigs that are housed with poultry are a particular danger as recombination of AI viruses from poultry and pigs is likely to result in the emergence of a human pathogen. Smallholders could well reduce their exposure to such a virus by separating pig and poultry production, and limiting access of smallholder poultry to wild birds (Horimoto and Kawaoka 2001).

Biosecurity can be improved for a smallholder farmer by housing chickens in small flocks in bird-proofed colony cages with a raised floor. There should be no scavenging (semi-feral) poultry having access to the area in the vicinity of the cage. This type of housing has the added advantage of controlling other endemic diseases and thus improving productivity of the flock. Further improvement in biosecurity is made possible by purchasing started

chickens (16 weeks of age) from a reliable, disease-free source, and keeping them in a single age group and replacing all of them at the end of their productive life with a new group.

The establishment of an industry sector based on the application of such biosecurity principles and other appropriate technology practices is a feasible way of improving poultry productivity. Improved housing, nutrition, biosecurity (isolation, clean drinking water etc.) and disease control (such as Newcastle disease vaccination) are discussed in Gilchrist (2009).

Official measures

In most cases of an initial incursion of HPAI into an area that has been free of the virus, the authorities will respond by attempting to stamp it out. This involves having an agreed eradication plan including a legal basis for action, penalties and compensation. The plan should have been subjected to simulation exercises in advance to ensure that all participants are aware of, and equipped for carrying out, their responsibilities. The FAO has developed a 'Good emergency management practices code for disease emergencies' (Anon. 2005c).

The campaign should recognise that live, infected birds are the major source of infection. Dead birds and contaminated people, equipment and faeces are also a risk but much less so. This means that containing and killing live, affected birds is the first priority.

The critical elements of an eradication campaign are:

- identification—confirming that the condition is HPAI
- quarantine—declaration of a quarantine area around the outbreak area
- standstill—halting of all movements of poultry, people, equipment and poultry products from the area
- slaughter—humane euthanisation of affected or close-contact birds
- carcass disposal—sanitary disposal of carcasses by burning or burying
- clean up—removal of faeces and litter, and cleaning and disinfection of premises and equipment
- compensation—provision of compensation, which is essential to encourage compliance
- other costs—consideration of the social and economic costs of an outbreak
- human safety—protection of smallholders and control personnel from infection
- investigation—diagnostic and monitoring activities.

Wild birds may be infected with virus in an outbreak but there be uncertainty if they are the source of infection or have become infected by contact with affected poultry. Attempts to prevent or control an outbreak by slaughter of wild birds appear to be unwarranted in the light of current knowledge. In any case, it is likely to be impossible to eliminate all members of a wild-bird population. Some protection can be obtained by providing added biosecurity measures such as bird proofing poultry housing and ensuring that drinking water is clean or adequately sanitised.

Vaccination

Vaccines must be manufactured according to the international manufacturing and quality control standards described in the 'OIE manual of standards for diagnostic tests and vaccines' (Anon. 2005d).

Stamping out remains the preferred means of control of HPAI but vaccines may be useful in control of the disease. There are three possible strategies for vaccine use:

- vaccination in response to an outbreak
- vaccination in response to a 'trigger' such as an outbreak in wild waterfowl
- preventive vaccination of all or part of a population of poultry when the likelihood and/or the consequences of an incursion is high.

A vaccine must be developed specifically for the type of virus involved in a particular outbreak. Use of vaccines to control the disease is contentious. Some experts feel that vaccinating hides the disease and hinders eradication. Others feel that vaccination reduces the level of excretion of virus particles and thus enables farmers to continue production while other control measures are adopted.

Most use of vaccines in Europe and North America has been to control LPAI viruses and may not be applicable to HPAI. Vaccines have been used successfully, in combination with other measures, to control H5N1 HPAI viruses in Hong Kong.

Several effective commercial vaccines are available. They provide protection against clinical disease and reduce mortality and the effects of disease on production. Most birds in a flock are also protected from infection. Those birds that remain

unprotected may still shed virus but shedding is reduced in both duration and quantity. This reduces the chances of infection of birds and humans.

Most current vaccines are inactivated, whole-virus antigen in oil-based emulsion adjuvant. A live recombinant fowlpox with H5 AI gene insert has been used in some countries.

A list of vaccines is available on the internet (Elkin 2005).

Vaccinated birds contain antibody and thus may not be accepted for international trade in live birds or poultry products as they cannot be easily differentiated from recovered (and possibly infected) birds.

Vaccines against H5 virus must contain the H5 antigen but may contain the same (N1) or other N antigens. If different N antigens are used it may be possible to differentiate between recovered and vaccinated birds.

The disadvantage of inactivated vaccines is that their efficacy is determined largely by the mass of antigen that can be administered parenterally. Catching and handling each bird is difficult and costly. Achieving a high antigen dose is also often a problem. Live virus can be administered by less difficult methods including orally in drinking water and by spray application. The live virus will multiply inside the bird and thus antigen mass is less important.

Several other vaccine types are being developed, including adenovirus-vectored vaccines that can be administered in the drinking water and Newcastle disease vectored types that can be administered as a spray. Molecular and subunit vaccines are also being considered but are some way off being available.

Training of vaccination teams is most important to ensure efficacy, safety and the production of good records of vaccines used and birds vaccinated.

The use of vaccine may be considered in those cases where the likelihood of an incursion of HPAI is high, where there is a high poultry density and where improved biosecurity is not possible and control by stamping out is unlikely. Vaccination in such cases may minimise virus propagation, protect susceptible birds and reduce the risk to human health.

While the efficacy of vaccine in other poultry species is unknown it seems reasonable to vaccinate such birds held in contact with smallholder chickens when the latter are being vaccinated.

Conclusion

As the H5N1 virus is still spreading geographically and changing genetically it is important to follow its path by referring to the OIE website for current developments.

It is likely that control measures will change as experience with the disease develops. Stamping out will usually be applied in the event of an initial incursion of HPAI in a country or region but vaccination may be introduced as an added tool if the first response appears inadequate.

A country or region that is free of HPAI should review conditions for importation of fertile eggs, live poultry and poultry products and equipment in order to improve the biosecurity level.

The epidemic of H5N1 also has an important public health dimension, with the death to date of a number of people, giving rise to serious concern about the potential for emergence of a pandemic strain of human influenza virus through reassortment of avian and, potentially, pig influenza viruses.

It is now clear that H5 HPAI viruses are endemic in parts of Asia and that the existence of reservoirs of infection in ducks and, potentially, wild birds and pigs, presents a serious challenge to eradication.

These factors highlight the necessity for countries infected with or threatened by HPAI viruses to implement appropriate measures for prevention and control. It is equally important that FAO and international organisations continue to collaborate with donors and affected countries in identifying and implementing strategies for recovery and rehabilitation of countries affected by HPAI (Anon. 2004).

References

Alexander D.J. 2003. Should we change the definition of avian influenza for eradication purposes? Avian Diseases 47, 976–981.

Anon. 2004. FAO recommendations on the prevention, control and eradication of highly pathogenic avian influenza (HPAI) in Asia. September 2004. At: <http://www.fao.org/againfo/subjects/en/health/diseases-cards/27septrecomm.pdf>. Accessed August 2005.

— 2005a. A global strategy for the progressive control of highly pathogenic avian Influenza (HPAI). FAO/WHO, May 2005. At: <http://www.fao.org/ag/againfo/resources/documents/empres/AI_globalstrategy.pdf>. Accessed August 2005.

— 2005b. FAO/OIE/WHO consultation on avian influenza and human health: risk reduction measures in producing,

marketing and living with animals in Asia. July 2005. At: <http://www.fao.org/ag/againfo/subjects/documents/ai/concmalaysia.pdf>. Accessed August 2005.

— 2005c. Good emergency management practice. At: <http://www.fao.org/ag/AGA/AGAH/EMPRES/e_gemp.htm>. Accessed August 2005.

— 2005d OIE manual of standards for diagnostic tests and vaccines. At: <http://www.oie.int/fr/normes/mmanual/a_00004.htm>. Accessed August 2005.

Easterday B.C., Hinshaw V.S. and Halvorson D.A. 1997. Influenza. Pp. 583–605 in 'Diseases of poultry, 10th ed.', ed. by B.W. Calnek. Mosby-Wolfe: London.

Elkin N. 2005. Avian influenza vaccines. At: <http://poultrymed.com/Vaccines/AI.html>. Accessed August 2005.

Gilchrist P. 2005. Involvement of free flying birds in the spread of avian influenza, Newcastle disease and infectious bursal disease from poultry products to commercial poultry. World's Poultry Science Journal 61, 198–214.

— 2009. Husbandry improvements and a training program for smallholder chicken producers. In 'Village chickens, poverty alleviation and the sustainable control of Newcastle disease', ed. by R.G. Alders, P.B. Spradbrow and M.P. Young. ACIAR Proceedings No. 131, 176–188. [These proceedings]

Halvorson D.A. 2002. The control of H5 or H7 mildly pathogenic avian influenza: a role for inactivated vaccine. Avian Pathology 31, 5–12.

Horimoko T. and Kawaoka Y. 2001. Pandemic threat posed by avian influenza A viruses. Clinincal Microbiology Reviews 14, 129–149.

Li K.S., Guan Y., Wang J., Smith G.J.D., Xu K.M. et al. 2004. Genesis of a highly pathogenic and potentially pandemic H5N1 influenza virus in eastern Asia. Nature 430, 209–212.

Liu J., Xiao H., Lei F., Zhu Q., Qin K., Zhang X., et al. 2005. Highly pathogenic H5N1 influenza virus infection in migratory birds. Sciencexpress, 6 July 2005; 10.1126/science.1115273. At: <www.sciencemag.org/.cgi/content/full/1115273/DC1>.

Mackenzie J.S. 1988. Prokaryotic and viral diseases transmitted by wild birds. Pp. 657–702 in 'Australian wildlife', Proceedings of the Post Graduate Committee in Veterinary Science of the University of Sydney.

Selleck P.W., Hooper P.T., Grix D.C. and Morrow C.J. 1994. The characterisation of an influenza virus isolated from Victorian ducks. Australian Veterinary Journal 71, 222–223.

Swayne D.E. and Halvorson D.A. 2003. Influenza. Pp. 135–160 in 'Diseases of poultry, 11th ed' ed. by Y.M. Saif. Iowa State University Press: Ames,Iowa, USA.

Swayne D.E and Suarez D.L. 2000. Highly pathogenic avian influenza. Review of Science and Technology, Organisation Internationale des Epizooties 19, 463–482.