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DOCUMENTATION OF GOOD PRACTICES (GP) FOR FAMILY POULTRY DEVELOPMENT IN SWAZILAND

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Table of Contents

List of Acronyms

ADP	Area Development Program
AIDS	Acquired Immunity Deficiency Symptom
APA	Associate Poultry Adviser
E	Emalangeni (Swaziland Currency)
FP	Fowl Pox
FAO	Food And Agricultural Organization Of United Nations
GAP	Good Agricultural Practices
GDP	Gross Domestic Production
GPs	Good Practices
HIV	Human Immune deficiency Virus
INFPD	Network for Family Poultry Development
INGOs	International Non-Government Organizations
IFAD	International Fund For Agricultural Development
LUSIP	Lower Usuthu Small Scale Irrigation Project
MOA	Ministry Of Agriculture
ND	Newcastle Disease
SWADE	Swaziland Water and Agricultural development Enterprise
SWOT	Strength, Weakness, Opportunities and Threats
WFP	World Food Program

Executive summary

With the assistance of FAO/IFAD, the International Network for Family Poultry Development (INFPD) is implementing the project "Smallholder Poultry Development Programme" (GCP/INT/197/IFA). In the context of the project, young professional experts on poultry have been trained as Associate Poultry Advisers (APAs) in order to promote and facilitate the development of the small scale poultry sector in developing and in-transition countries. Each APA has been associated with an IFAD or FAO project in order to build field experience and undertake a study on a specific area of family poultry.

The APA assigned to the IFAD funded project "Lower Usuthu Smallholder Irrigation Project (LUSIP)" in Swaziland has carried out a study on relevant Good Practices (GPs) of family poultry and properly documented these for a wider dissemination. The study builds on information gathered through interviews to project personnel and government technical officers, discussions with poultry producers' groups, field visits and workshops and it is completed by a desktop review of the main documents on the subject. This paper is intended to document the family poultry production system along with GPs, with special emphasis on the semi-scavenging system and the use of Aloe for prevention of poultry diseases in Swaziland.

The Family Poultry Production system in Swaziland mainly falls into three types: the semi scavenging system, the scavenging system and the small scale intensive system. Selected farmers, with support from different projects have followed the semi scavenging system. However, most farmers rear the native breed of chicken using the scavenging system. The small scale intensive system is mainly used for broiler rearing. About 70 percent of households keep indigenous poultry comprising mainly of Swazi chickens, ducks, geese and turkeys.

The majority of rearers do not provide housing for their chickens at night. Birds usually pass the night on a tree and the day scavenging in the household yard. In the semi scavenging system, local low cost building materials have been used for housing/night shelter to protect chickens against adverse harsh weather conditions and also to protect chicks against predators. Farmers have made nests for broody

hens for laying and hatching of eggs. A survey showed that forty six percent of farmers let their birds stay in trees tops and eleven percent of farmers provide housing and protection for chicks of less than a month old.

Farmers do not provide enough feed, indicating that nutrition is a major constraint in scavenging poultry production. Chickens usually feed on grass, leaves, termites, grasshoppers, ants, larva, worms, crop residues and kitchen waste. In the semi scavenging system farmers allow the chickens to scavenge for some time in a day, and also provide 30-40 grams of yellow crushed maize for each chicken. In Swaziland, small scale intensive broiler farms are using commercial ready-made feed for their birds.

Disease prevention measures are used in the scavenging and semi-scavenging poultry production systems in Swaziland. *Aloe* is the most used preventive medicinal plant. The preparations are usually include one or more leaves, but amounts are not specific. Some specific concoctions are said to prevent or treat specific diseases. Beside of this, Newcastle Disease (ND) and Foul Pox (FP) vaccines have been used for chickens in Swaziland, but most farmers with the scavenging system do not use vaccines. Semi-scavenging system farmers usually apply the vaccine once in a year before the rainy reason (September). Farmers use herbal medicines for controlling external and internal parasite. In the small scale intensive system of broiler rearing farmers use routine vaccinations for Newcastle (ND), Fowl Pox (FP) and Gumboro diseases.

Natural incubation is the main source for producing native day old chicks. Broody hens are used for natural incubation of hatching eggs. Indigenous chickens typically lay between 3 and 5 clutches of eggs per year, each of 10 to 15 eggs, giving a total number of eggs between 30 and 75 per hen. The hatchability of eggs is between 80 and 83 percent, and the mortality of chicks within one month is 67 to 70 percent, so only 30 to 33 percent of chicks reach maturity. Three types of brooding system are followed by family poultry producers: (i) Natural Brooding - chicks are reared by the hen until they are naturally mature; (ii) Restricted Natural Brooding - chicks are reared by the hen for one month, and then removed from their mother; (iii) Artificial Brooding - chicks are removed from the hen within one day of hatching and kept in a box with ash & dry grass in a warm place.

Seventy eight percent of women are involved in different family poultry rearing activities such as: feeding, taking care of broody hens & chicks, setting hatching eggs, and slaughtering of chickens. Men are mainly involved in purchasing of chicken feed. Family poultry activities create 46 person days per year of employment for women in Swaziland. Women were often found to have a large degree of control over the income derived from family poultry production, indicating the potential to improve their welfare and empowerment. It was found that a non-descript indigenous chicken can generate a net income of E 611 each year, while a commercial broiler under the small scale intensive system can generate gross margin of E 7 over a period of 35 days. Providing night shelter and supplementary feed, the use of Aloe spp. for increasing birds' capacity to resist to common diseases, separation of hen from baby chicks can be promoted as good practices for the family poultry production system in Swaziland. The semi scavenging system which combines all those practices has been found as most important good practice (GP) for the family poultry production system in Swaziland.

With implementation of those good practices, the net income per hen per year can increase from E150 to E600. The number of clutches per year and average number of egg laid per hen can increase from 3 to 5 and 40 to 60 respectively. Good Practices have shown to reduce chick mortality (without intervention 66 percent and with intervention 33 percent) and marketing ages (without intervention 12 month and with intervention 8 month), increased meat supply (without intervention zero and with intervention, 2 chickens per month) and egg consumption (without intervention zero and with intervention 5 eggs per month). Therefore, it is concluded that the improved family poultry production system contributes more to family income, especially for women, and can supply additional high quality protein for consumption by family members. Training on feeding and brooding, health and bio-security management, supply of the necessary start-up inputs, and support for marketing linkages could all strengthen family poultry activities in Swaziland, which would give a year round reasonable income and improve household food security.

Background and Justification

The geographical coordinates of The Kingdom Swaziland are 26 30^0 S and 31 30^0 E. The country is completely landlocked by the Republic of South Africa and Mozambique. The total surface area is 17 000 km^2 and the country is divided in 3 ecological zones, the Highveld, the Middleveld and the Lowveld. The Highveld is a rainy area which receives between 800-1000 mm annually while the Lowveld is drought prone with annual rainfall between 200-400 mm per year and the Middleveld is in between the two. The agriculture sector contributes 12% to GDP, and 76 percent of all exports (FAO 2007). About 68 percent of the population of Swaziland live below the poverty line and the Lowveld has the highest density of the poor. In an effort to reduce poverty, the government of Swaziland in collaboration with IFAD established the Lower Usuthu Small Scale Irrigation Project (LUSIP). LUSIP is a poverty alleviation initiative in the South-Eastern Lowveld of Swaziland. The main goal of LUSIP is to improve standard of living of the people in the project area, who are among the poorest in Swaziland. LUSIP was planned to convert 6500 ha under dry land farming into irrigation blocks. Besides this, LUSIP also promotes livestock production, with beef, dairy, piggery, family poultry etc. In recent years family poultry has shown a steady growth. With its short production cycle, it can address issues of food security and cash flow. Different donor funded projects (IFAD, WFP, FAO etc) work in Swaziland to improve household food security of vulnerable people in a sustainable and integrated way. In this context, the APA assigned to LUSIP, Swaziland intended to identify the relevant GPs for family poultry and properly document them in order to disseminate the practices to other rural poultry development projects as well as to other countries.

Methodology

Good Practices (GPs) go hand-in-hand with developing an understanding of family poultry development and the use of simple tools to sensitize actors, build coalitions and influence policy formulation and implementation (SA-PPLPP 2009).

Picture 1: Discussion with Government Livestock Personnel

Picture 2: Discussion with women family poultry producers in the field .

FAO (2004) promotes the development of Good Agricultural Practices (GAP) based on the four pillars of economic, environmental and social sustainability and food safety. A Good Practice is a unique mixture of technologies and institutional set up that has remarkable and sustainable impact on famers' livelihoods (Pica Ciamarra *et al*. 2010). Different traditional and recommended practice have been followed for family poultry rearing in Swaziland.

To identify Good Practices (GPs) of family poultry, a series of activities have been carried out – such as personal interviews of project personnel & government officers, group discussions, field visits and a workshop (Annex 1). Participants of the workshop and other events have described the different practices of family poultry of Swaziland. The use of herbal plants for preventing diseases, housing, feeding, breeding, separation of chicks from hen after hatching and indigenous poultry rearing by the semi-scavenging system etc practices have been highlighted. A description of Practice is given below:

Use of herbal plant: Farmers use different herbal plants for preventive poultry diseases. Aloe is a widely used herbal plant by the farmers which is a traditional and popular practice in Swaziland.

Housing for chicken: Farmers who are keeping semi-scavenging birds have constructed poultry shed and fence within the household yard. Motherhens, chicks and pullets can pass the night inside and come out at the morning from the shed. Baby chicks remain there during the day. LUSIP assists farmers to build poultry sheds to protect chickens against harsh weather conditions and also to protect chicks against predators.

Separating chicks from the hen: Broody chickens that have hatched eggs take care of their chicks. Farmers separate chicks from the hen within 0-30 days and provide a warm environment for them. Separating chicks from the hen is traditional practices of farmers. LUSIP promotes the practices to separate chicks from hen after hatching.

Supply of supplementary feed: Farmers do not provide enough feed for scavenging poultry which is indicated by their low productivity. The LUSIP intervention is to allow the chickens to semi-scavenge, and to provide 30-40 grams of yellow crushed maize for each bird as a supplementation to increase productivity.

Natural breeding: Maintaining a cock to hen ratio of 1:10 for producing fertile eggs. For controlling inbreeding, farmers should introduce new cocks from distant villages every 12 months. Although this is recommended practices most of the farmers do not follow the practice. Therefore LUSIP assists the farmer to implement this practice.

Semi scavenging system: Indigenous chicken are reared by the farmers under the semi-scavenging system. It is practiced with a small flock of native birds that is reared free range for some parts of the day and intensively managed for the rest of the time. Selected farmers, with support from different projects have followed the semi scavenging system in Swaziland. In this system farmers usually combine all or some of the abovementioned traditional or improved practices for getting more benefit from family poultry.

Priority GPs were identified by a scoring system (Annex 2). After identification of these GPs, they were verified and justified through discussions with technical personnel and farmers. Primary information was collected from the field visits through group discussions and personal interviews according to a check list (Annex 3). Secondary information was collected from different reports and journals. The semi-scavenging system which is a combination of all of those practices was found as the most important GPs in Swaziland. During the field visits of the APA assignment and interaction among different stakeholders of the poultry sector, the whole family poultry production system became known to a large audience. Therefore, the APA decided also to describe the family poultry production system along with the GPs especially with an emphasis on the practices of the semi-scavenging system in Swaziland.

Poultry sector of Swaziland

Poultry are the most widely owned animals among households of rural Swaziland. A total of 92.5 percent households keep poultry, as compared to 50 percent keeping cattle, 46 percent goats, and 16 percent pigs (IFAD 2001). The country does not import any chicken meat and eggs as the local production meets demand. Broiler farming is very popular for both commercial and small holder farmers. Employment

in commercial and smallholder farming is close to 1200 and 600 people, respectively, with women being a majority in small holding farming. About 90 percent of locally produced eggs come from the large commercial sector, mainly from two large farms, namely Eagles Nest in Malkerns and Usuthu Poultry in Mzimpofu. About 70 petrcent of households keep indigenous poultry comprising mainly of Swazi chickens, ducks, geese and turkeys. The number of the chickens in the country is estimated at 1.8 million (Vilakati-K. 2008).

The main objective for keeping indigenous chickens is for home consumption and local sales to supplement household income and for socio-cultural purposes. The MOA in conjunction with IFAD, FAO and INGOs (like World Vision) have developed a family poultry development program with the semi-scavenging system to improve husbandry practices and so to encourage rural households and increase egg and meat production from their existing stock.

Family Poultry Production System

The Family Poultry Production system in Swaziland consists mainly of three types.
(1) Semi scavenging system: a small flock of native or improved birds that is reared free range for some parts of the day and intensively managed for the rest of the time;
(2) Scavenging system: a small flock of native birds allowed to fully scavenge without feed supplementation
(3) Small scale intensive system: usually broilers (100 to 500 birds) are reared under this system.
The management practices of these systems are described below.

Housing

For the semi scavenging system local low cost building materials are being used for housing to protect chickens against harsh weather conditions and also to protect chicks against predators. The construction of poultry sheds is one of the good practices of family poultry producers. In the scavenging system farmers do not prepare any shelter, and birds usually spend the nights in trees. Scavenging in the

household yard during the daytime has negative bio-security implications for both the birds and family members. According to Maxwell (2011) forty-six percent of farmers let their birds stay in trees and 11 percent of farmers provide housing and protection for chicks under one month of age. As the majority of farmers do not provide housing for their chickens, birds roosting in trees are thus predisposed to theft, predation and unfavourable weather conditions. Huque (1989) claims that in Bangladesh during the brooding period, between 18 to 32 percent of all chicks are lost to predation. Biswas *et al.* (2006) found that losses due to predation are equally important as losses due to animal diseases; Conroy *et al.* (2005) report that bird mortality due to predation ranges between 19 and 24 percent in Udaipur district of Rajasthan, and between 11 to 33 percent in Trichy District of Tamil Nadu; and according to Jalaludeen (2009), almost half of the mortality of the native chicken population in Kerala, including chicks, growers and layers, is due to predation.

The good practices shows that shelter for birds can be easily build at low cost by using locally available materials wood, grass straw, rock, mud paste- thereby reducing predation and allowing compliance with some bio-security measure.

Feeding

Observation show that scavenging chickens do not receive enough feed, indicating that nutrition is a major constraint in scavenging poultry production. Scavenging chickens usually feed on grass, termites, grasshoppers, ants, larva, worms, crop residues, kitchen waste, and they get water from drains and ditches. Good practices indicate that small simple changes in feeding practice can significantly contribute to increased bird productivity in terms of both number of egg laid and growth rate. A small amount of crushed yellow maize can increase the quantity and quality of the daily ration and hence increase productivity. Using plastic or wood containers to provide water for the birds reduces the worm-load in poultry flocks. The LUSIP intervention is to allow the chickens to semi-scavenge, and to provide 30-40 grams of yellow crushed maize for each bird as a supplementation to increase productivity. In Swaziland, small scale intensive broiler farms use commercial ready-made feed.

Medication

Herbal methods are used to prevent (or treat) diseases in birds in scavenging and semi-scavenging poultry flocks in Swaziland. They are usually used for unspecific diseases symptoms. In Kenya *Aloe Vera* is said to treat Newcastle Disease, *Croton megalocarpus*, coryza sinusitis, *Combretum mole* and treat intestinal worms (Okitoi *et al*. 2007). Ethno veterinary medicine is of great importance in the smallholder sector of Zimbabwe. Being readily accessible, inexpensive, and apparently effective (Mwale *et.al.* 2005) these methods increasingly gain recognition at the expense of conventional drugs.

In Swaziland *Aloe* is the most popular herbal medicine. *A Vera* and *A spicata* leaves are generally used only when a bird looks unhealthy, goes off its feed, or blood is seen in its droppings. The leaves are then harvested, cleaned with water, and crushed before they are mixed with drinking water for chickens. The medicated water is offered to all birds until they show signs of good health. In addition to their use in chickens, the herbs are also used in Swaziland for the treatment of diseases in cattle, sheep, goats, and human beings. Herbal plant are also used for controlling external and internal parasites.

Box 1. Preparation of Snuff from Aloe and Tobacco :

Four type of aloe plants (Aloe chortolirioides; Aloe minima; Aloe kniphofioides; Aloe bainesii) are used as herbal medicine for preventive treatment of indigenous chicken in Swaziland. Aloe leaves are sun-dried and ground up. Ground aloe leaf (three medium sized leaves) is mixed with one ground leaf of dried tobacco. This mixture is called "Snuff".

Method of administration
The mixed snuff powder (one teaspoon) put in drinking water (3-5 liters), and is provided to the chicken for a whole day. This powder is also put in the nest for controlling external parasites. People are also use the extract from fresh aloe leaf (three medium size leaves) and in water (5 liters) for chickens.

Farmers in Swaziland usually do not use inorganic (conventional) medicines unless there is no other option. LUSIP has strongly encouraged the use of the local organic indigenous medicinal plant *(Aloe)* in order to prevent poultry disease. The practice of using herbal plants to prevent poultry diseases is also found in other African countries (Table 1).

Table 1. EVM used to treat ND in Family Poultry in rural Africa

Poultry species	Form of application	Country
All species	*Parkia filicoidea* barks are put into drinking water	Nigeria[1]
All species	*Cassia didymobotrya* leaves or *Euphorbia matabelensis* latex are added to drinking water	Zimbabwe[2]
All species	*Euphorbia candelabrum Kotschy var. Candelabrum* stem or *Capsicum annuum* fruit together with *Iboza multiflora* leaves are used in drinking water	Tanzania[3]
Chickens	*Lagenaria breviflora* and *Capsicum frutescens* fruits are put into drinking water	Nigeria[4]
Chickens	*Khaya senegalensis* barks and *Capsicum sp*. extracts are soaked in drinking water	Senegal[5]
Chickens	*Mangifera indica* barks are put into drinking water	Gambia[6]
Chickens	A handful of *Mucuna sp.* leaves is crushed and soaked in 1 litre of water for 2-4 hours, the mixture is then filtered and given as drinking water	Kenya[7]
Chickens	Two handfuls of *Capsicum annuum* (red pepper) seeds are crushed and mixed with 1 litre, and one glass (about 250 ml) of the mixture is used for 10 birds as drinking water for 3 days	Kenya[7]
Chickens	A handful of *Amanranthus hybridicus* var. *cruentus* leaves and flowers is crushed together with about 5 *Capsicum sp.* (hot pepper) fruits and 1-2 *Aloe secundiflora* leaves in about 2 litres of water for 6 hours. If birds cannot drink this mixture, each of them is drenched with 2 tablespoonfuls twice a day.	Kenya[7]
Chickens	Four chopped *Capsicum sp*. fruits are added to 2 spoonfuls of soot and half a glass of water. *Agave americana* leaves is crushed and the juice coming out is collected. Twenty drops of this juice are added to the pepper/soot mixture. The mixture is given to the birds (as much as they will drink), and this process is to be repeated once a day until the birds recover.	Kenya[7]
Chickens	A handful of *Aloe sp.* leaves are crushed in a container, and 0.5-1 litre of water are added. Birds are allowed to drink as much as they want.	Kenya[7]
Chickens	*Aloe sp*. plant leaf extract is used in drinking water	Gambia, Zimbabwe, Tanzania[8]
Guinea fowls	*Cassia sieberiana* barks are used as cold infusion	Mali[9]

Source: [1]Nwude and Ibrahim (1980), [2]Chavunduka (1976), [3]Mkangare (1989), [4]Sonaiya et al (1993), [5]Guèye (1998), [6]Bonfoh (1997), [7]Anonymous (1996), [8]Kitalyi (1998) and [9]Nomoko (1997)

Picture 3 : *Aloe vera* plant (Photo: Rajiur)

Picture 4: Chicken drinking snuff added water (Photo: Rajiur)

Good practice indicates that addition of some *aloe* snuff powder to water has been shown to be a powerful immunization against poultry diseases of the flocks. Good

practice also indicates that adding of one or more fresh leaves of aloe to water can prevent or treat specific diseases. It is necessary to test more extensively the efficacy of the various concoctions used by farmers for treating ND. Although not all traditional remedies currently used are likely effective, it is reasonable to expect that some local therapies work effectively (Gueye 2002). Scientists have discovered over 150 nutritional ingredients in *Aloe Vera*. They all work together in a synergistic way to provide healing and health giving benefits (Annex 4).

Box 2. *Good Practice: Use of Aloe*

Good Practices are characterized by being socially and economically acceptable and technically sound. Aloe is not distributed to chicken to prevent any specific diseases rather than it used for all types of disease prevention. Farmer practices, experiences of field visits and information of secondary sources showed that the herbal plant could control poultry diseases. Local knowledge for indigenous poultry health management should be promoted to minimize veterinary costs. Local herbal plants like Aloe could be widely used for prevention of poultry diseases. It is one of the good practices in Swaziland for family poultry producers. Besides the use of aloe, a vaccination program must be ensured for certain key diseases.

Vaccination

Usually two type of vaccine are used for chickens. One is to protect from Newcastle Disease (ND) and the other from Fowl Pox (FP). The ND vaccine is usually administrated orally and put in the drinking water. Farmers usually give the ND vaccine once a year before the rainy reason (September). Most farmers do not use the FP vaccine.

Breeding and brooding

Breeding and brooding, these two "Bs" are very important to maintain and increase a good quality poultry flock. Correct selection of cocks and hens is essential to maintain good genetic stock. Some farmers use good quality cocks and hens for breeding and cull unproductive and weak chickens from their flock from time to time. For controlling inbreeding, farmers introduce new cocks from distant villages

every 12 months. Replacement of hens is from one to another farm/homestead. The cock and hen ratio is maintained at 1:10 in order to get good quality of fertile eggs.

Broody hens are used for natural incubation of hatching eggs. Usually natural brooding is used to provide warmth for baby chicks, and hens are allowed to rear their own chicks. Family poultry productivity in Swaziland is very low, with only about 30 percent of chicks reaching maturity (Maxwell 2011). Dakpogan *et. al.* (2011) reported that in the Southern Region of Benin only 24 percent of village chicks survived 2 month of age in the free range production system. Seventy three percent of the losses were due to diseases, 25 percent due to predation and disappearance. In Swaziland a broody nest is made for the broody hen, and 10-12 fertile eggs put in the nest for natural incubation. Broody hens sit on the eggs for up to 21 days. Farmer usually place the eggs in the nest at night so chicks will have a dry and fresh environment when they hatch.

In the semi-scavenging system farmers set up brooding nests at a special site for reproduction that is separated from the other poultry. To keep them safe, brooding nests are placed in a high place such as a small tree. Breeding birds (hens and cocks) are kept at the reproduction site. At this site hens lay and hatch eggs. After hatching, day-old chicks are transferred to productive site under a brooding room and reared here for up to one month with proper temperature control and feeding. When they reach one month of age, chicks are transferred to another shed and reared under the semi-scavenging system until marketing at 7 to 8 months of age.

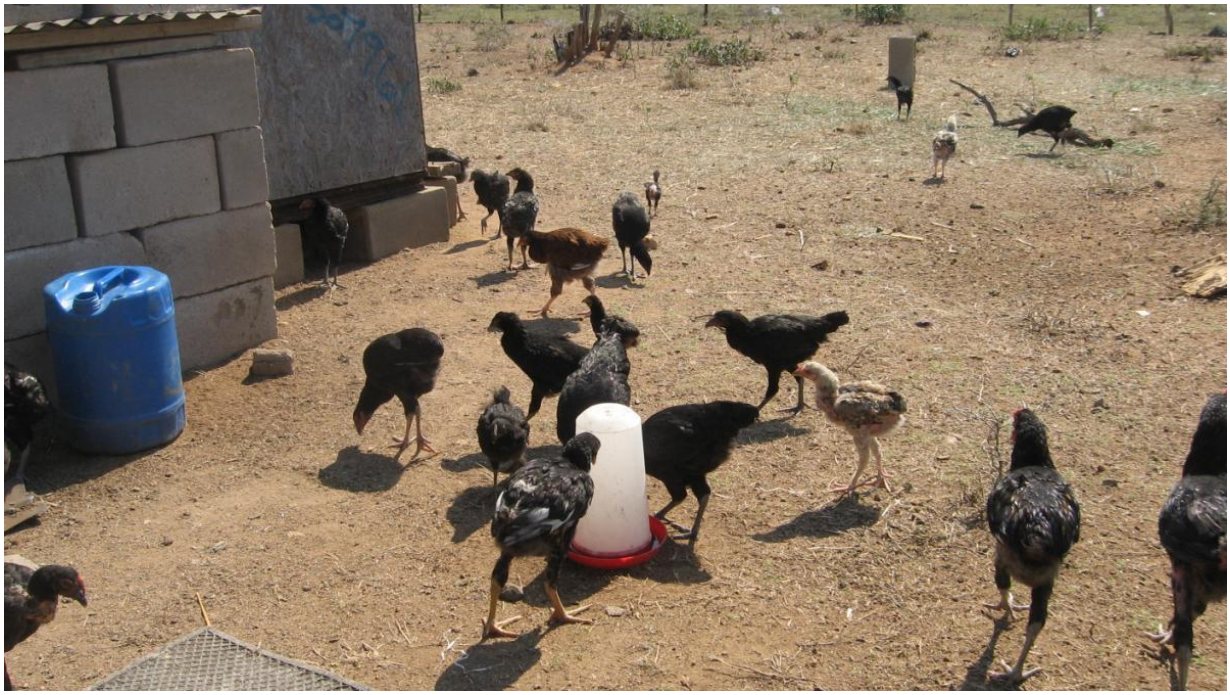
There are three types of brooding systems followed by family poultry producers in Swaziland. (i) Natural Brooding: chicks are reared with the hen until they are naturally separated; (ii) Restricted Natural Brooding: chicks are reared with the hen for up to one month, and after this chicks are removed from the mother; and (iii) Artificial Brooding: chicks are removed from hen at hatching and kept in the box with ash and dry grass in a warm place.

Exchange of cocks and hens reduces inbreeding in the flock and is a GP. Semi-scavenging farmers follow this GP. By this practice, the genetic materials can be improved to increase the productivity of the flock.

Picture 5: Brooding nest set up on upper place in the reproductive site of household yard (Photo Rajiur)

Picture 6: Chicks transferred into the productive site of the household yard with feed and warm environment (Photo: Rajiur).

Picture 7: Chicks are kept in a warm place after removal from the hen (Photo: Rajiur)



Picture 8 : Providing water in a plastic container under productive site of the household yard.(Photo : Rajiur)

Box 3. *Good Practice: Separation of hen from Day Old Chick*

The Good Practices show that an appropriate extension process, which leads to small changes in husbandry practices, can enhance the contribution of household production for improvement of livelihoods. Efficient husbandry practices in small-scale farming are typically context-specific, based on local resource endowment and knowledge and, on occasion, build on traditional practices.

Farmers are separating baby chicks from the hen after hatching. They keep these chicks for one month in a box with ash and dry grass in a warm place at the proper temperature. Separating baby chicks from the hen is another good practice in Swaziland for family poultry producers. As a result of this intervention the number of clutches for each hen increases from 3 to 5 per year and the number of egg produced increases to 60-90 each year instead of 30-45. A suitable temperature must be provided for the chicks, especially in the first two weeks. Therefore, to get more benefit out of this practice, brooding with appropriate temperature must be followed by family poultry producers in Swaziland.

Training and Capacity Building

The Ministry of Agriculture (Poultry Section) provides training to the farmer groups at the Tinkhundla (Regional Development Centers). Besides that Non Government Organizations (NGOs: World Vision, Caritas, etc) SWADE (LUSIP) also organize training on "family poultry production" for their target groups with assistance of government technical persons. NGOs and LUSIP monitor field activities and provide coaching to farmers in the most vulnerable and poverty stricken parts of the country. The Agricultural Faculty of the University of Swaziland also provides poultry production training, although the indigenous poultry production course is very basic. A common training manual and curriculum that addresses the family poultry production system in Swaziland is not yet developed. Under the LUSIP project, joint initiatives by the Government and the project cell of LUSIP have been undertaken for conducting training of poultry keepers.

Groups of producers receive training on each topic in one day. In this way the group gets trained on all three topics in three days. New groups are usually given a three days training as indicated in Table 2. Thereafter each group will be trained through mentoring and coaching on specific topic based on field demand.

Table 2: Type of Training provided by LUSIP.

Type of Training	Duration of training	Number of Batches	Number of Participant
Chick rearing and housing	1 day (2 hours)	3	25
Supplementary feeding of indigenous poultry	1 day (2 hours)	3	25
Disease management	1 day (2 hours)	3	25

Picture 9: APA and LUSIP Technical Person deliver Field Training on Family Poultry Management (Photo: Rajiur).

Box 4. World Vision Promoting Family Poultry by following Semi-scavenging System.

GILGAL Area Development Program (ADP) is implemented by World Vision in Swaziland. The aim of this program is to improve the living standards of 18 630 people at Gilgal ADP, especially women and children. The major interventions of this program are to provide safe and clean water to 300 households; enroll 346 children in school; provide corn-soya, a highly nutritious blend, to children who are suffering from malnutrition; formation of an anti-AIDS club to organize awareness campaigns; micro-enterprise development of crop, livestock, and poultry farming by equipping local business people with business management skills; and to eventually start a revolving loan scheme.

This program assists 46 farmers rearing indigenous chicken by the semi-scavenging system. World Vision organizes training for farmers with collaboration of government officers. They also help farmers to sell chickens to the formal market. World Vision has planned to open an outlet in town which will be operated by a farmer's federation. (source: Leaflet, World Vision, Swaziland, www.wv.org.za, and field visit, October 2011.)

Marketing

Prices of poultry products depend on body weight, age, poultry species/breed, sex, quality, disease outbreaks, geographic location, socio-cultural events or activities (e.g. special banquets for family distinguished guests, gifts, and cocks as alarm clock for the villagers), religious ceremonies, magical practices and traditional human medicine. Birds showing traits that are in great demand are more expensive. (Guèye 2011)**.** In restaurants demand for chicken meat as a fast food is increasing more than beef. A short market survey indicated that 35 percent beef and 65 percent chicken meat is sold in restaurants in Manzini city. On the other hand more beef (68%) than chicken (32%) is sold at butchery shop which is mainly used for family home consumption.

Rural people who rear native birds in the scavenging and semi-scavenging systems mostly market these in the local market. Butcheries purchase broilers from small and medium scale intensive broiler farmers and process and dress the birds according to customers' choice. In addition broilers are also sold live in local markets and directly to hotels and restaurants. There are three marketing channels for the poultry meat sector in Swaziland:

Producers/ Farm owners /farmers → Neighbors / Consumers

Producers/ Farm owners /farmers → Abattoirs → Hotels and Restaurants → Consumers

Producers/ Farm owners /farmers → Abattoirs → Butchery / Retailer → Consumers

Indigenous chickens are usually sold to the local market for prices ranging from E30 to E50 per bird. However, with interventions of extension personnel who have advised farmers to bring their birds to the near market or restaurant for selling, farmers are now aware about market price and they sell to the organized market at E45-60 per dressed bird. The organized markets comprises of restaurants, caterers and hotels. Women bring batches of at least 10 chickens to these buyers. Indigenous chicken is a new product in the formal market .

Market linkage is a Good Practices. It shows that a semi scavenging poultry system can be established successfully when farmers have access to a reliable market. However, this requires certain conditions:

(i) A comprehensive systems of input supply and marketing support is necessary, often established through cooperative mechanisms;

(ii) Appropriate targeting and training of selected farmers is essential, as poor farmers often do not run their farm commercially;

(iii) Financial support is necessary, as rarely (if ever) do farmers have enough savings to make the investments that are needed to build housing and buy appropriate equipment (e.g. feeders, waterers);

(iv) It can take years to find out the appropriate institutional setting which allows farmers to cooperate efficiently and set up profitable small-scale poultry production units; and

(v) The public sector has a potential role to play in helping farmers explore different business and cooperative models, which need to be found and developed through experimentation and trial and error (Pica-Ciamarra *et. al*. 2010).

Seasonal Fluctuations

Seasonal variation influences family poultry production. Family poultry production depends on natural feed resources which vary with the season. There are two seasons in Swaziland summer and winter. Plenty of grains, vegetable and crop residues are available as scavengeable feed in the summer season. This period is also suitable for breeding of insects due to the rainy and warm weather. Therefore scavenging chickens can feed on grass, vegetable and crop residues, and different type of insects (viz: termite, larva, worms, ants, grasshopper etc.). Due to feed availability during the summer season, the egg production is higher, but the hatchability is lower due to high temperature and moisture which causes eggs to become spoiled. Egg production is decreased due to low feed availability in winter period but the hatchability is high due to the suitable temperature. Due to more disease outbreaks the chick mortality is also higher during the summer period than in winter. Table 3 illustrates the seasonal influences on family poultry production in Swaziland.

Table 3: Seasonal fluctuation of family poultry production in Swaziland
(source: Field visit / Group discussion: 8 September 2011)

Activities	**Winter**	**Summer**	**Remarks**
Mortality	Low	High	More disease due to high temperature and moisture
Egg production	Low	High	Availability of natural feed
Hatchability	High	Low	Suitable temperature
Feed availability	Low	High	More insects, grass ,crop residue in summer
Grazing and insect availability	Low	High	Natural grass grows due to rain mainly in December

Women Participation

Indigenous chickens are mainly reared and controlled by women because men are mostly concerned with goats and cattle. Women also go to formal markets to sell their birds. During the group discussion and field visits, 78 percent of the women said that they are involved in different activities of poultry rearing like feeding, rearing baby chicks, setting of hatching eggs, taking care of broody hens, and slaughtering of chickens. Men are mainly involved in purchasing of chicken feed. Women are involved for about one hour in a day, while men are involved in poultry activities for about half of the time of women (only 30 minutes in a day). Annually, on average a woman is employed for 46 person-days (8 hours per day) per year on a farm created for family poultry activities in Swaziland. Women are often found to have a large degree of control over income derived from family poultry production, indicating the potential improvements in their welfare and empowerment.

SWOT Analysis

Table 4: SWOT analysis of Swaziland Family Poultry, Source: Stakeholder workshop , September 2011

Strengths	Weaknesses	Opportunities	Threats
Existing one university: providing training and conducting research. Well trained livestock extension officers and specialists. Farmers use their indigenous knowledge for preventing of poultry diseases. NGOs involved in the poultry sector (World Vision, Caritas etc.). Provision of grant fund In some part of the country trained officers and development workers are available for the field.	Inadequate number of extension officers. Lack of knowledge of farmers on disease management in rural areas. Staffs from NGOs only provide advice on farm management and marketing, but do not assist in health management. Poor information channel (from field to desk/office). National Research Centre/institute don't focus much on family poultry (University and MALKERNS) Government support is not sufficient (eg. Good quality scavenge breed , vaccination, extension, marketing) Processing activities in rural areas are not regulated or controlled. Lack of transport for extension officers. Temporary project staffs.	Farmers cooperate with the government and NGOs officers for family poultry rearing. Available fallow land for poultry feed production (maize). Marketing linkage: NGOs assist farmers in marketing chickens to get high prices. International stakeholder support: consultant come from other countries for sharing technical knowledge for implementation of the project.	Lack of finances for family poultry development. Outbreak of diseases (especially Newcastle, Fowl Pox). Foreign investors: Businessmen come to do poultry business in the country. They have opened very big hatcheries to supply commercial broiler and layer DOC. (eg: Eagles Nest, Valley Farm etc.).

Evidence of Good Practices

GPs of family poultry are those activities which are followed by farmers, organizations or producers that will positively impact on their capacity to produce more for both food security and increased income.

Family poultry production represents an appropriate system to contribute to the family income of poor and small farmers, especially women. It is makes an important contribution in supplying family members with high quality protein food. Poultry products can be sold or bartered to meet essential family needs such as medicine, clothes and school fees. Village chickens are active in pest control, provide manure, are required for special festivals, and are essential for many traditional ceremonies (Alders *et al.*, 2003). Estimation of gross margin and net income is difficult for subsistence farming. Farmers usually rear indigenous chickens alongside with their other farming activities. They do not keep records on their investment and returns. The cost of birds and other inputs are difficult to measure: barter exchange, the value of supplemental feed given to birds – which may also have nutritional value for family members (e.g. broken maize) – the existence of alternative employment opportunities, and the availability of local material to build shelters, all influence the investment and running costs of poultry enterprises.

Tables 5-7 provide a snapshot for the documented economics of Good Practices in family poultry production systems. Returns for a one year investment in one single hen in the semi-scavenging system are handsome. The return on investment for this one bird is about 70 per cent and it provides as annual net income about E611 (Table 5). A commercial broiler under small scale intensive system can generate a gross margin E7 per bird for each batch gown over 35 days (Table 6).

A before/ after comparison (Table 7) shows that "Good Practices" in family poultry production (indigenous chicken under semi-scavenging system) have increased the contribution of poultry birds to household income and food security. Due to following the implementation of Good Practices in Swaziland the net income per hen per year has increased from E150 to E600. The number of clutches per

year and average number of eggs laid per hen have increased from 3 to 5 and 40 to 60, respectively.

Box 5. **A case study of GPs implementation**

Elias Smantji Mamba, is a poultry farmer of LUSIP keeping semi-scavenging birds. He is rearing indigenous hens and cocks to produce fertile eggs and baby chicks all year round. After brooding, he rears the chicks for 7-8 months under the semi-scavenging system. A total of 6 broody hens are now hatching the eggs and 5 chickens are laying eggs. A total of 37 chicks are being kept in the brooding room at a proper temperature, with chicks removed from hen within 5-7 days of hatching and reared intensively for one month. A total of 94 young chickens (four-five month age) are being reared in the semi-scavenging system in a fenced area of the household yard in the fencing, with 7.83 square meters of land for each young bird.

Mr.Mamba provides supplementary feed (40-50 grams yellow crushed maize /bird/day) and green grass to his chickens. The ND vaccine has been given to chicken one time in a year by oral administration. The herbal plant, *Aloe vera,* is widely used for controlling diseases. Two fresh leaves (each leaf length 8-10 cm, width 4-5 cm) are crushed and put in water (2 liters) and then provided to the chickens. He can earn E340-350 each month from his farm. He can also consume near about one chicken and 10-12 eggs each month from the farm.

Mr. Mamba has separated his farm into reproductive and productive sites. Breeding stock (hens and cocks) is rearing at the reproductive site. At this site hens lay and hatch eggs in the nest. After hatching, day-old chicks are transferred to the productive site under brooding room and reared here for one month with proper temperature control and feeding. After reaching one month of age, the chicks are transferred to another shed and reared until marketed at 7-8 months old.

Picture 10: Mr.Mamba provides green grass to chicken(Photo: Rajiur)

Good Practices are associated with definite improvements in reducing chick mortality (without intervention 66 percent and with intervention 33 percent) and marketing ages (without intervention 12 month, with intervention 8 month), increasing numbers of chicken consumption (negligible without intervention ,two per month with intervention) and egg consumption (negligible without intervention and five per month with intervention). These achievements are often due to better management practices like: separation of the hen from day old chicks, providing a warm place to Day Old Chicks (brooding), preparation of night shelter, providing supplementary feed, use of *Aloe* for remedial measures of poultry diseases and providing marketing support.

Table 5: Annual net income from an indigenous chicken

Items	Parameters	No.	Unit value	Total value	Remarks
Revenues			E	E	
	Eggs laid	46			
	Eggs spoiled	12			
	Eggs sold / consumed	4	1.5	6	1.5 E for each egg
	Chicks hatched	30			
	Dead birds	8			
	Cocks sold / consumed	15	70	1050	
	Hens sold	7	60	420	
	Gross income			**1476**	
Costs	Hen	1	60	60	
	Feed per bird	23	32	736	2.9 E per kg feed Feed intake 30 gm per day for each bird
	Health care per bird	23	3	69	
	Total cost			**865**	
Benefits					
	Gross Margin /Net income			**611**	611 E each bird for each year
	(2011 prices)				
	Return on investment (%)			70.6	
	1USD=7 Emalangeni (E),Swaziland Currency				

Table 6: Gross Margin from small scale intensive broiler framing (100 birds)

Number of DOCs	100				
Mortality rate (%)	1				
Finish weight(kg)	2				
FCR	1.8				
Labour days	0				
Prices					
DOC (E/ bird)	4.5				
Finished bird(E/ bird)	27				
Feed (E/bird)	4.2				
Vet medicines (E/bird)	1.52				
Item	Unit	Number	Price/unit	Total Value	Value per bird
OUTPUT					
1. Birds out					
Finished birds	Bird	90	30	2700	27.00
2. Birds in					
Day old chicks	Bird	100	4.5	450	4.50
Total output				2250	22.50
VARIABLE COSTS					
Feed &chick	kg	342	4.2	1436.4	14.36
Veterinary Medicines	per bird	95	1.52	144.4	1.44
Casual labour	Day	0	0	0	
Other costs	Unit	0	0	0	
Total variable costs				1580.8	15.81
GROSS MARGIN				669.2	6.69

1USD=7 Emalangeni (E),Swaziland Currency

(Sources: Field Visit, Sigadlamazulu Investment, September 2011). Sigadlamazulu Investment (P O Box 410, Siphofaneni, Swaziland) provides inputs to 60 to 70 farmers in each month who are producing 100 birds for each batch. There are three outlets in Siphofane like Sigadlamazulu Investment. Mortality rate 10% and marketing value of each live finished bird E30 (this value varies between E30 and E40).

Table 7: Technical and Economical information of indigenous chicken of Swaziland (Source: Group Discussion August 2011)

Variable	Before intervention	After intervention	Remarks
Number of clutch per year	3	5	Removing chick from hens within 0-5 days.
Number of eggs per clutch	10-15	12-18	Providing supplementary feed especially crushed yellow maize (60-70 gm/bird).
Total number of eggs production per year	30-45	60-90	Removing of chick and provide feed.
Consumption of eggs from own production (Number)	0	2-5	Consume infertile eggs
Number of Egg set up for hatching	12-15	10-12	Selection of fertile eggs
Chick production per incubation	10-12	10-12	Natural brooding
Number of chick died (Within one month)	7-8(66%)	3-4(30%)	Protection from bed weather, predators and improve management.
Marketing age (month)	10-12	7-8	Improve management (breeding and feeding) Cock buys from another village.
Marketing weight (kg)	1.5-1.8	1.5-1.8	Improve management
Consumption of chicken (Number/month)	-	2	Mortality reduce due to improve management system
Marketing Price (E)	20- 30	40-45	Marketing linkage
Net income /Year (E)	120-150	500-600	Intervention for management system
1USD=7 Emalangeni (E),Swaziland Currency			

Conclusion and Recommendation

Improvement of family poultry production can have a positive effect on household food security, income generation, the wellbeing of vulnerable rural households. The semi-scavenging system will allow chickens to feed in homestead yards and combines low production costs with high returns. Providing night shelter and supplementary feed, the use of *Aloe spp*. for increasing birds' capacity to resist to common diseases, separation of hen from baby chicks can be promoted as good practices for the family poultry production system in Swaziland. The semi scavenging system which combines all those practices has been found as the most important Good Practice (GP) for the family poultry production system in Swaziland.
Training on poultry rearing and management, supply of the necessary start-up inputs (including housing structures and equipment), and help with marketing linkages can all be strengthened to promote family poultry production for year-round income and improved food security.
For the development of family poultry production in Swaziland the following recommendations are made:

- A homogenous training curriculum and modules should be developed and adopted at the national label.
- The follow-up and monitoring of field activities should be strengthened. Leading farmers might be identified and trained for providing technical support (viz: vaccination, marketing linkage etc) to farm households. It is recommended that a small fund be created at poultry group level for purchasing vaccines and other medicine. Members of the group should consider paying a small fee to vaccinators.
- A register book should be maintained on all farms for keeping technical and financial records. A recommended format should be introduced for this purpose.
- To minimize the mortality of chicks, brooding technology and vaccination programs should be ensured for family poultry producers. After removing the chicks from the hens, they should be kept in a warm location and provided with appropriate feeding for one month (the brooding period). After this initial period, cockerels and pullets might be distributed or sold to other poultry farmers for the next production phase.
- Supplementary feed should be ensured for chickens every day. The formula for this feed should include broken maize, sorghum, blood meal, bone meal, termites, grass and leguminous leaves and seeds etc.
- Exchange visits or cross visit contacts from farmer to farmer might be incorporated into project activities for rapid expansion of the semi-scavenging family poultry system.

References

Anonymous.1996. Ethnoveterinary medicine in Kenya: A field manual of traditional animal health care practices. ITDG and IIRR, Nairobi, Kenya

Alders, R. 1996. Facilitating women's participation in village poultry projects: Experiences in Mozambique and Zambia. Proceedings of the 20th World's Poultry Congress, New Delhi, India, Vol III: 441-447.

Bonfoh, B .1997. Les dominantes pathologiques et les contraintes sur la productivité des poulets dans les systèmes avicoles extensifs en Gambie: propositions et solutions. Thèse de Doctorat de 3è Cycle, No. 26, Université Cheikh Anta Diop, Dakar, Sénégal

Biswas P.K., G.M.N. Udin, H. Barua, K. Roy, D. Biswas, A. Ahad and N.C. Debnath 2006. Causes of loss of Sonali chickens on smallholder households in Bangladesh. *Preventive Veterinary Medicine*, 76(3-4): 185-195.

Chavunduka, D M .1976. Plants regarded by Africans as being of medicinal value to animals. Rhodesian Veterinary Journal 7(1): 6-12

Conroy C., N. Sparks, D. Chandrasekaran, A. Sharma, D. Shindey, L. R. Singh, A. Natarajan and K. Anitha 2005. The significance of predation as a constraint in scavenging poultry systems: some findings from India. *Livestock Research for Rural Development*, 17(6).

Dakpogan H.B, Kyvsgaard N.C, Chrysostome C and A. Permin 2011. Chick survivability in free-range production system. INFPD, Family Poultry Communications. Vol. 20, No. 1 2/36

Food And Agriculture Organization of United Nations 2007. FAO Emergency and Rehabilitation Programme in Swaziland. Ministry of Agriculture. Mbabane, Swaziland

Guèye, E. F.1998. Village egg and fowl meat production in Africa. World's Poultry Science Journal 54: 73-86

Guèye, E F. 2002. Newcastle disease in family poultry: prospects for its control through Ethno-veterinary medicine. Livestock Research for Rural Development. 14(5). 2002.

Guèye, E. F. 2011. Paper presentation at the Associate Poultry Advisors Training, IFAD/FAO/INFPD Smallholder Poultry Project, Research and development: Issues and Options, 07-08 July 2011, Rome, Italy.

Huque, Q.M.E. 1989. *Village Poultry Production System in Bangladesh*. Proceedings of the 3rd National Conference of Bangladesh Animal Husbandry Association, Dhaka, Bangladesh.

International Fund for Agricultural Development , Report 2001.

Jaluladeen, A. 2009. Poultry Production Scenario in Kerala: An Overview. Unpublished paper, Centre for Advanced Studies in Poultry Science, Kerala Agricultural University, Mannuthy, Thrissur, Kerala.

Kitalyi A J .1998. Village chicken production systems in rural Africa: Household food security and gender issues. FAO Animal Production and Health Paper 142, Rome, Italy

Ministry of Agriculture and Cooperative (MOAC). Swaziland. 2006

Mwale M, Bhebhe E., Chimonyo M and T.E. Halimani 2005. Use of Herbal Plants in Poultry Health Management in the Mushagashe Small-Scale Commercial Farming Area in Zimbabwe. Intern J Appl Res Vet Med • Vol. 3, No. 2, 2005.

Mkangare, M M J .1989**.** Collection of Tanzanian medicinal plants for biological activity studies. Proceedings 7th Tanzania Veterinary Association Scientific Conference, Vol. 7, Arusha, Tanzania, pp. 67-78

Nomoko M. 1997. Cassia sieberiana DC. (Caesalpiniacées). Le Flamboyant 43: 4-6

Nwude N and Ibrahim M A .1980. Plants used in traditional veterinary medical practice in Nigeria. Journal of Veterinary Pharmacology and Therapeutics 3: 261-273

Okitoi, L. O.; H O Ondwasy, D N Siamba and D Nkurumah. 2007. Traditional herbal preparations for indigenous poultry health management in Western Kenya. Livestock Research for Rural Development 19 (5) 2007.

Pica-Ciamarra,U.; Mamta Dhawan. 2010. Small-Scale Poultry Farming and Poverty Reduction in South Asia. From Good Practices to Good Policies in Bangladesh, Bhutan and India . Animal Production and Health Division, FAO, Rome South-Asia Pro-Poor Livestock Policy Programme (SA-PPLPP), New Delhi.

Sonaiya E B, Laogun E A, Matanmi O, Daniyan O C, Akande B E, Oguntade E A, Omoseibi R O and V.E. Olori 1993 Health and husbandry aspects of village extensive poultry production in South Western Nigeria. In: Proceedings of an International Workshop on Village Poultry Production in Africa (Pandey V S and Demey F, Eds.), Rabat, Morocco, pp. 34-41

South Asia Pro-Poor Livestock Policy Programme (SA PPLPP). 2009. Code: BDGP01, "Mitigating Disease and Saving Valuable Assets: Poultry Vaccinators Delivering Services to doorstep of the Poorest in Bangladesh". Good Practice Note, Delhi, Website: www.sapplpp.org

Thwala M.S. 2011.Analysing the value chain of the Family Poultry sub sector in the Lower Usuthu Project area in Swaziland. APA assignment, INFPD, FAO, Rome, Italy.

Vilakati Kiondo 2008. Poultry Production Training Manual, University of Swaziland, Faculty of Agriculture. Swaziland .

Annex 1: Persons and institutions met to discuss activities for identifying and justifying GPs of family poultry in Swaziland.

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Sigadlamazulu Investment 27 September 2011: A shop of input supplier .
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Mos Mangwe Edlamin Lead Farmer of World Vision. Phongwane community , Makhwadlu sub centre
Sipho Sibandze, Senior Program Development Officer, World Vision , Manzini
Mr.Mawenzi Dlamini; Agribusiness Marketing Specialist. LUSIP

Annex 2. Scoring of different practices for family poultry development in Swaziland.

Items	Use of ethno veterinary medicine	Semi scavenging system	Housing for chicken	Natural brooding system	Supply of supplementary feed	Natural breeding system
Short explanation of the practices	Farmer use some herbal plant (like Aloe, Bark etc; It makes chop/thrash and mix to water) for preventive treatment.	Indigenous chicken reared by the farmers under semi-scavenging system.	Farmer construct poultry shed and make a fence. Mother hen, chick and pullet can pass the night and come out at the morning from the shed .Baby chick staying remaining in the day.	Broody Chicken hatched eggs and takes care of their chick. Separation of chick from hen within 0-30 days and provide warm temperature to chick.	Farmer use supplementary feed as crush maize to the scavenged chicken.	Maintain Cock and Hen ratio 1:10 for producing fertile eggs.
Good	7	2	3	5	4	2
Fair	3	8	3	4	6	3
Poor	0	0	4	0	0	5
Total (Good & Fair)	10	10	6	9	10	5

Annex 3: Check list for Group Discussion, Personal Interview and FGD

#___

Date:_____

Address:_____

Group name _____

Name:_____
Gender:_____
Job:_____
Interviewer:_____

1. How many chicken you have when you start chicken rearing/ business?

No of Broody hen ------No of cock------- No of young bird---------
No of chicken --------- Others----------Total--------

2. How many time lay egg (clutch) of your hen in each year
Before intervention ----------After intervention ---------

3. How many egg lay in each clutch of your hen
Before intervention ----------After intervention ---------

4. How many egg set up for hatching
Before intervention ----------After intervention ---------

5. How many chick (DOC) produce for each incubation
Before intervention ----------After intervention ---------

6. How many chick (DOC) died within one month
Before intervention ----------After intervention ---------

7. How many chick (DOC) died after one month
Before intervention ----------After intervention ---------

8. Do you vaccinated your chicken YES:-----NO:-----

If yes which vaccine have you give and how to give

9. What is the main reason of death (specify 3)

10. What the land size is of scavenge area / fence area?
    Width---------- Length----------
11. Do you make a night shelter for your chicken? YES------NO-------
12. Do you make a nest for laying hen and broody hen? YES------NO-------
13. If make how much cost to make it?
14. Measurement of the nest
15. Do you provide feed to your bird YES------ No------
16. Which feed ingredient usually you provide to your chicken?
17. How much amount feed you supply to your chicken in a day? Quantity
18. Where do you buy the feed:
    Local market------- feed company ------other---------
19. Do you use any medicine (organic or inorganic)? YES:-------NO:---------

Describe / Name	For What	How to use

20. Do you have a de worming program? YES--------NO-------
21. Do you have a program against external parasites? YES--------NO----------
22. What do you do against parasites?
23. Do you comply with the bio security measures of your farm? YES:------NO:------
24. Where you sell your chicken
    Local market---------- Organized Market (specific)--------
25. When you sell (age) you bird in the market? --- And how much-----
26. What is the marketing body weight (kg)
27. Do you face any problem in marking the chicken? Specific---------
28. Cost- benefit of the poultry farming
    Total cost (chick, feed, treatment, labour and others)-----
    Total sell (chicken, egg, manure) ------
29. SWOT analysis for family poultry development.

30. Seasonal fluctuation of family poultry production in Swaziland

Issues	Winter	Summer	Monthly (Any specific month)
>Mortality			
<Mortality			
> Egg production			
< Egg production			
> Hatchability			
< Hatchability			
<Feed availability			
>Feed availability			
<Grass and insect availability			
>Grass and insect availability			
> price of the eggs			
< price of the eggs			
> price of hens			
>price of hens			

31. Participation of gender in family poultry farming
Name of the activity: Male----------Female----------
Man (hr/day)
Woman (hr/day)

Specific observations:

_____

_____

Annex 4: Chemical Constituents of Aloe Vera

(Source: Christopher's Herbal Legacy;
http://www.herballegacy.com/Baldwin_Chemical.html)

Aloe vera has marvelous medicinal properties. Scientists have discovered over 150 nutritional ingredients in Aloe vera. There seems to be no single magic ingredient. They all work together in a synergistic way to create healing and health giving benefits. The ten main areas of chemical constituents of Aloe vera include: amino acids, anthraquinones, enzymes, minerals, vitamins, lignins, monosaccharide, polysaccharides, salicylic acid, saponins, and sterols.

The amino acids in Aloe vera are the building blocks of protein and influence brain function. Humans require 22 amino acids and the body will make all of them except for eight essential amino acids which our body gets from the food/drinks that we take in. Every one of the essential amino acids are available in Aloe vera and they include isoleucine, leucine, lysine, methionine, phenylalanine, threonine, valine,and tryptophan. Some of the other non-essential amino acids found in Aloe vera include alanine, arginine, asparagine, cysteine, glutamic acid, glycine, histidine, proline, serine, tyrosine, glutamine, and aspartic acid.

Located in the sap of the leaves it will find twelve anthraquinones, a phenolic compound that has stimulating effects on the bowels and antibiotic properties. In small amounts the anthraquinones do not have a purgative effect. They help with absorption from the gastro intestinal tract and have anti-microbial and pain killing effects. Too many anthraquinones can produce abdominal pain and diarrhea. The most important anthraquinones are aloin and emodin. They are anti-bacterial, anti-viral, and analgesic. The anthraquinones in Aloe vera breakup residue, pus and lifeless cells, bring blood to the region and flush out material from the wounds and ulcers.

Enzymes act as biochemical catalysts that break down the proteins we eat into amino acids. The enzymes turn the food into fuel for every cell in human body, enabling the cells to function and work efficiently. "The main enzymes found in Aloe vera include Amylase (breaks down sugars and starches), Bradykinase (stimulates immune system, analgesic, anti-inflammatory), Catalase (prevents accumulation of water in the body), Cellulase (aids digestion - cellulose), Lipase (aids digestion - fats), Oxidase, Alkaline Phosphatase, Proteolytiase (hydrolyses proteins into their constituent elements), Creatine Phosphokinase (aids metabolism), and Carboxypeptidase."

For instance lack in zinc and/or Vitamin B6, body will not be able to break down or use protein. Because of the healing properties of Aloe vera and its synergistic action, the body receives what it needs to work properly. Aloe vera, an anti-oxidant rich plant, contains vitamins such as A, C, and E plus the minerals, zinc, and selenium. Anti-oxidants help boost the immune system and combat free radicals in the body.

It also contains Vitamins B1, B2, B3, B5, B6, and B12 along with choline, calcium (teeth and bone formation, muscle contractions and heart health), magnesium(strengthens teeth and bones, maintains healthy muscles and nervous system, activates enzymes), zinc (speeds up wound healing, mental quickness

assists with healthy teeth, bones, skin, immune system, and digestive aid), manganese (activates enzymes, builds healthy bones, nerves and tissues), chromium (assists with protein metabolism and balancing of blood sugars), selenium which all influence brain performance.

Additional minerals found in Aloe vera include copper (important for red blood cells, skin and hair pigment), iron (involved in oxygen transportation and making of hemoglobin in red blood cells), potassium (helps with fluid balance), phosphorus (helps build bones and teeth, assists with metabolism and body pH), and sodium (regulates body liquids, helps with nerve and muscle performance, and helps deliver nutrients into body cells).Aloe vera also contains the trace minerals of rhodium and iridium used in cancer and tumor research experiments.

Another component of Aloe vera consists of the lignins, a major structural material of cellulose content, that allows for penetrative properties. Aloe vera can soak into the skin up to seven layers deep. Lignins penetrate the toughened areas of the skin being beneficial for skin problems such as eczema and psoriasis.

The next elements of Aloe vera it will discuss include monosaccharides and polysaccharides. Monosaccharides contain the simple sugars which include glucose. The polysaccharides are the more complex long-chain sugars involving glucose and mannose or the gluco-mannans. These sugars are ingested whole from the stomach. They do not get broken down like other sugars, and appear in the bloodstream in exactly the same form. This process is known as pinocytosis. Once in the blood stream, they exert their healing and immuno-regulating effect. Some of these polysaccharides are not absorbed but stick to certain cells lining the gut and form a barrier preventing absorption of unwanted material so helping to prevent a leaking gut syndrome. The sugars are also used in moisturizing preparations.

One polysaccharide, acemannan, is known for its ability to restore and boost the immune system by stimulating the production of macrophages and improving the activity of T-Lymphocytes by up to 50 %. Acemannan produces immune agents such as interferon and interleukin which help to destroy viruses, bacteria, and tumor cells. Acemannan improves cellular metabolism by normalizing cellular function and regulating the flow of nutrients and wastes in and out of the cells. It knows how to destroy parasites and fungus. In some AIDS patients, it even protected the immune system from the toxic side effects of AZT. Carrington Laboratories in the United States have separated the acemannan from Aloe vera. The product is sold as “Carrisyn” and is being used for treatment of AIDS and Feline leukemia.

Many sources stated that Aloe vera has mucopolysaccharides, nitrogen containing polysaccharides, found in animals and bacteria. A regulation and testing board for Aloe vera products known as the International Aloe Science Council concludes that some people are misinformed and confused on terminology. The Aloe has polysaccharides but not mucopolysaccharides.

Aloe vera contains salicylic acid which is an aspirin-like compound with anti - inflammatory, analgesic, and anti-bacterial properties. It has anti-pyretic properties for reducing fevers. Other constituents of Aloe vera would include prostaglandins, tannins, magnesium lactate, resins, mannins, proteins such as lectins, monosulfonic acid and gibberlin.

Another constituent of Aloe vera includes saponins. These are soapy substances from the gel that is capable of cleansing and having antiseptic

properties. The saponins perform strongly as anti-microbial against bacteria, viruses, fungi, and yeasts. The plant sterols or phyto-steroids in Aloe vera include Cholesterol, Campesterol, Lupeol, and B (Beta sign) Sitosterol. The plant steroids have fatty acids in them that have antiseptic, analgesic, and anti-inflammatory properties.