Can small-scale poultry production contribute to household food security in the Maphephetheni lowlands, KwaZulu-Natal?

Moleka Pange Mosisi

Examiner's copy

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African Centre for Food Security,
School of Agricultural Sciences and Agribusiness,
Faculty of Science and Agriculture,
University of KwaZulu-Natal,
Pietermaritzburg.

ABSTRACT

This study investigated the feasibility of small-scale poultry production to contribute to household food security in the Maphephetheni lowlands in KwaZulu-Natal. Forty households, selected by stratified random sampling (eight households per sub-ward) participated in a trial to assess the feasibility of egg and broiler production, from commercial lines, and the potential for generating income to improve household food security. The study established that participating households acquired the necessary skills through a training module offered, actively engaged in poultry production and marketing of the produce, and managed their funds well. Market demand for poultry products in the Maphephetheni lowlands was high from both local consumers and traders. Egg production profit was constrained as eggs were not sorted into sizes according to South African standards and local selling prices, but, contrary to commercial market practice, the eggs are graded 'standard' regardless of size. Both egg and broiler production are technically feasible in Maphephetheni lowlands, but broiler production is more economically viable than eggs and more highly desired by households.

Households reported that poultry production could provide much needed income and reduce poverty and hunger in their community. Although household dietary diversity did not improve, income increased and was put into a savings account. Households borrowed and used this money for various needs, but not necessarily to supplement their diets. Commercial point-of-lay pullets and three-week old vaccinated broilers could be used in the Maphephetheni lowlands, but broilers were more commercially viable than point-of-lay pullets. It is recommended that broiler houses be established with the capacity for brooding each 500 day-old chicks which are sold (live) at six weeks. However, technical and financial support is required to maximise the benefits, increase household income, improve diets and reduce vulnerability to food insecurity.

DECLARATION

I, Moleka Pange Mosisi declare that:

(i) The research reported in this mini-dissertation, except where otherwise indicated, is my original research;

(ii) This mini-dissertation has not been submitted for any degree or examination at any other university;

(iii) This mini-dissertation does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from those persons;

(iv) This mini-dissertation does not contain other authors' writing, unless specifically acknowledged as being sourced from other authors. Where other written sources have been quoted, then:

  a) their words have been rewritten but the general information attributed to them has been referenced;

  b) where their exact words have been used, their writing has been placed inside quotation marks and referenced;

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Signed:  Date 18 December 2009

Moleka Pange Mosisi

As supervisor, I agree to submission of this mini-dissertation for examination.

Signed: …….....Date…….

Prof Sheryl L Hendriks

As co-supervisor, I agree to submission of this mini-dissertation for examination.

Signed: …….....Date…….

Mrs Nicky Tyler

DEDICATION

To my late father Molamba Pange Mosisi

and mother Liwodja Simbi,

in gratitude for a disciplined upbringing.

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CHAPTER 1
THE PROBLEM AND ITS SETTING

1.1 Introduction to the research problem

Household food security, increased income and improved well-being are outcomes of sustainable livelihoods (Department for International Development, 2000). A food secure household has sufficient access to both food and income and a diversified diet throughout the year to meet the nutrient needs of all household members, leading to an active and healthy life (Burgess and Glascauer, 2004; NEPAD, 2009). The absolute prevalence of food insecurity in South Africa is not known (Hendriks and Maunder, 2006). However, available data suggests that between 35 and 75 per cent of South African households experience food insecurity (Hendriks, 2005). An estimated 60 per cent of the national average of stunted children is found in the provinces of KwaZulu-Natal, Eastern Cape and Northern Province. Two thirds of South Africans are considered poor (National Department of Agriculture, 2002) and the number of people living in poverty in South Africa has increased since the end of apartheid in 1994, the prevalence of malnutrition remaining substantially higher than in developed countries (Aliber, 2003). Meth and Dias (2004) have warned that these numbers might increase over time unless sustainable interventions to alleviate food insecurity are undertaken to increase both dietary intake and income generation (Katalyi, 1998). Although chicken plays a crucial role in rural KwaZulu-Natal (Hatch, 1996), research studies in the province have focused more on cattle ownership (Dlamini, 2002).

1.2 Importance of the study

Poultry production has the capacity to respond to increased demand through the rapid supply of meat and eggs, when compared with cattle or other large livestock which have longer production cycles. Kabatange and Katule (1990) calculated that if each chicken laid 60 eggs in a year with 50 percent hatchability, at the end of a five-year production period, the supply of meat would far exceed the output of beef production (the animal usually takes 5-7 years to reach slaughter age). In South Africa, few households are able to maintain enough chickens to achieve household financial and food security (Addo, 2003). However, Addo (2003) concluded that, if encouraged, many more households could attain food security and financial

stability through poultry production. Earlier studies by the author in the Maphephetheni lowlands, a rural area near Durban, KwaZulu-Natal, established that:

- poultry was perceived to be beneficial for household food security by the community
- poultry production was low compared with what households would like to consume
- poultry production was not practised as an income-generating activity
- a number of constraints to keeping poultry in the Maphephetheni lowlands were reported (Mosisi, 2006)

With this background information, the study set out to establish the feasibility of poultry production in contributing to household food security in Maphephetheni.

1.3 Statement of the research problem

The study set out to assess whether poultry production can contribute to household food security in the Maphephetheni lowlands. To assess this question, the following sub-problems were considered:

Sub-problem one: Do sampled households have poultry-production skills?

Sub-problem two: Is there a market for poultry products in and around Maphephetheni?

Sub-problem three: What are the costs and other requirements for the establishment of poultry production in Maphephetheni?

Sub-problem four: What socio-economic benefits will poultry production generate in the Maphephetheni lowlands?**Sub-problem five:** Can poultry production improve dietary diversity and poultry consumption in the Maphephetheni lowlands?

1.4 Study assumptions

It was assumed that all households had no knowledge and very little experience of poultry production at the start of the project. It was assumed that the sampled households understood the objectives of this study and provided honest and accurate information. Given that the researcher was not conversant with the local language, it was assumed that translation was accurate.

1.5 Study limits

The findings in the study may not be universally applicable and generalisable as the study was restricted to the sampled households in the Maphephetheni lowlands. Also, the study focussed on chickens only to the exclusion of other birds.

1.6 Structure of the mini-dissertation

The current chapter outlines the introduction to the study, statement of the research problem, importance of the study, assumptions and study limits. Chapter two presents a review of related literature. Chapter three outlines the study methodology. Chapter four presents the results and discussion. Chapter five presents the study conclusions and recommendations.

CHAPTER 2
REVIEW OF LITERATURE

The Framework for African Food Security (New Partnership for Africa's Development (NEPAD), 2009) identifies food security challenges as: inadequate food insecurity risk management, especially at the household level; inadequate food production and lack of access to a market for producing households; lack of income for the vulnerable; and hunger and malnutrition. Therefore, and as described earlier, a food secure hosehold has sufficient access to food and/or income, and consumes a diversified diet (NEPAD, 2009). Conversely, a food insecure household worries about food and income shortages, consumes an inadequate diet and ultimately experiences hunger and malnutrition (Hendriks, 2005). The Comprehensive Africa Agriculture Development Programme (CAADP) recognises the potential of agriculture to drive economic development in Africa and enable vulnerable households to attain food security (AUC/NEPAD, 2003).

Despite South Africa's strong economy and good agricultural production, many previously disadvantaged people in South Africa are still unemployed and rely on purchased food, therefore forcing government to adopt programmes to combat, among other things, vulnerability to food inflation (Schmidt, 2005). Katalyi (1998) has identified small-scale poultry production as a sustainable intervention against food deprivation and poverty among vulnerable households, because poultry production provides the means for increased household dietary intake and income opportunities. The preference for poultry meat in South Africa is high compared with pork and red meat, because poultry is healthier and cheaper. Very few studies have focused on poultry production for food security.

This chapter reviews literature on food (in)security at the global and national levels and discusses causes, consequences and the measurements of food (in)security. The chapter argues that poultry production is a potential vehicle to fight food insecurity in rural South Africa.

2.1 The state of food (in)security in the world

Food is both a basic human need (as are shelter, health; clothing and education) and right (Shaw, 2007). The World Health Organisation (WHO, undated) and the World Bank (2007)

reported that the consequences of food deprivation or malnutrition are adverse throughout the life of a food insecure individual, for example a malnourished child can suffer from brain damage due to iodine deficiency, blindness due to vitamin A deficiency and ultimately die from multiple deficiencies. Survivors may have impaired intellectual development that limits earning capacity and increases vulnerability to infections which may result in death. Malnutrition can be a vicious cycle as malnourished mothers produce underweight babies who are inappropriately fed due to lack of resources. This scenario is perpetuated when the affected parent unwittingly causes further malnutrition through inappropriate breastfeeding, leading to poor growth (WHO, undated; World Bank, 2007). In 1990 alone, stunting and iodine, iron and vitamin A deficiencies were estimated as causing the loss of 46 million years of productive life in the world (WHO, undated).

The South African government has warned that people who lack food can be pushed to engage in criminal activities and generate high social costs including policing; criminal and judicial expenses and low investor confidence, resulting in loss of capital investment in the country.(National Department of Agriculture, 2002).

The concept of food security became popular after the food crisis that affected the world in the mid 1970s. This crisis was due to the rise in food prices and because many food-deficit countries failed to import enough food, owing to their limited foreign exchange reserves (World Bank, 2007). Interest in food security moved progressively from a focus on food availability to food access, food use and, more recently, to a focus on the right to adequate food (World Bank, 2007). Before the 1970s world food crisis, low-income, food-deficit countries increased domestic production and import capacity, and international trade made food available at lower real prices (World Bank, 2007). However, despite ample food availability, many households could not afford food because of poverty (Sen, 1981; Maxwell, 1996; May, 1998; Schmidt, 2005). Today, household food security analysis has become more relevant than national or global level analysis, as issues of food distribution and purchasing power affect access to food (Maxwell, 1996).

The state of food (in)security has been characterised in the 21st century by the global food crisis and the number of food insecure people has reached the historic figure of more than 1 billion hungry people (FAO, 2009a). Of these people, 642 million (10.5 per cent more than prior to 2008) are in Asia and the Pacific, 265 million (11.8 per cent increase) are in sub-

Saharan Africa, 42 million (13.5 per cent more) in the near East, North Africa and Latin America and 53 million (12.8 per cent increase) in the Caribbean. Food insecurity also increased in the developed countries, accounting for 15 million hungry people (15.4 per cent increase over 2008) (FAO, 2009a).

While the 1970's price increase was mainly due to the ten-fold increase in the oil price from US$ 3.50 to US$35 a barrel during the crisis period, a combination of factors can explain the increase in food prices observed since 2005 (Manuel, 2008). These factors include increased per capita food consumption, mostly in Asia; oil price increases; biofuel technology and the global economic crisis (International Food Policy Research Institute (IFPRI), 2008; Manuel, 2008; FAO, 2009a). Given the major global increase of food prices (Fig 2.1), the global economic crisis exacerbated food insecurity as it lowered the purchasing power of vulnerable households. There was relative food price stability from 1850 to the 1970s and an increase in real terms by 75 per cent between 2005 and 2008. In 2009 alone, it is estimated that Foreign Direct Investment (FDI) in developing countries will decrease by 32 per cent which will automatically reduce employment rates in these countries (FAO, 2009a) Official Development Assistance (ODA) is projected to decrease by 25 per cent in 71 of the poorest countries. Remittances from developed countries (money migrants sent to developing countries) from developed countries, which have been growing at 20 per cent, will decrease by eight per cent and these countries will have difficulty in borrowing from financial markets as institutions will prefer to lend to more reliable countries (FAO, 2009a). A decrease by as much as nine per cent in trade volumes is predicted to affect countries that rely on exports (FAO, 2009a).

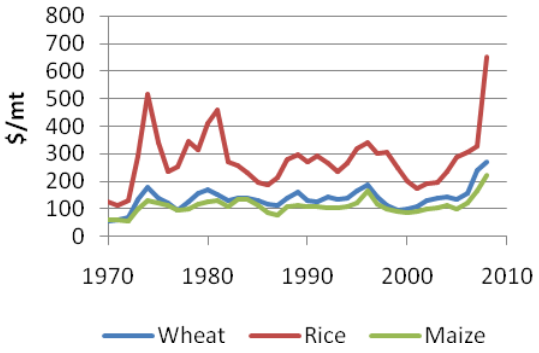

Figure 2.1: International prices of key food crops (FAOSTAT, 2008).

Increased food consumption has been reported in Asia as a result of its rapid economic growth and huge population (Havener *et al.*, 2005). Rural development and improved household income in Asia is predicted to increase fish, meat and dairy product consumption (Delgado *et al.*, 1999). Increased global population (estimated to be 7.9 billion in 2025) which correlates with increased food consumption, is predicted to increase annual

world demand for cereal grains by 1 billion metric tonnes by 2030 (50 per cent increase in world cereal production compared to production in 2000) (Havener *et al*., 2005). The conflicting demand for cereals as food, feed and fuel, increases food prices and decreases food access for vulnerable households, while reducing smallholder profits (Alders and Pym, 2008). Maize, in particular, illustrate this conflict demand. In commercial poultry, cattle and dairy productions, maize and soybean are main sources of feed and feed represent at least 70 per cent of production costs in these production systems (Neitz and Dugmore, 1995; Havener *at al.*, 2005; Alders and Pym, 2008). These crops are used in the growing biofuel industry, but are also essential for household food security (Alders and Pym, 2008). The expansion of biofuel production as green energy, perpetuate another conflict between land and water resources required to grow cereal to meet increased demand for food (Cotuala *at al*, 2009). These demand conflicts threatens global food availability and household food security.

The World Food Programme (2008) reported that the 2008 global food price crisis caused civil unrest and food protests on most continents: Africa (Burkina Faso, Cameroon, Cote d'Ivoire, Egypt, Guinea, Mauritania, Morocco, Mozambique, Senegal, South Africa and Zimbabwe); the Americas (Argentina, El Salvador, Haiti, Honduras, Mexico and Peru) and Asia (Afghanistan, Bangladesh, Cambodia India, Indonesia, Jordanian, Kazakhstan, Lebanon, Malaysia, Mongolia, Myanmar, Uzbekistan, Vietnam and Yemen).

The world's population is likely to reach approximately 7.9 billion by 2025 and about 10 billion by the end of the twenty-first century. To meet the demand caused by population growth alone, projections suggest that a 50 per cent increase in world cereal production (one billion metric tons) and 85 per cent increase in meat production per year is required before 2030 (FAO, 2003). Biofuel demand could significantly increase these projections.

The United Nations (2008) reported that Heads of states and governments met to discuss food insecurity in 1996 at the World Food Summit in Rome and released the Millennium Development Goals (MDGs), as follows:

MDG1: Eradicate extreme poverty and hunger

MDG2: Achieve universal primary education

MDG3: Promote gender equality and empower women

MDG4: Reduce child mortality

MDG5. Improve maternal health

MDG6: Combat HIV/AIDS, malaria and other diseases

MDG7: Ensure environmental sustainability; and

MDG7: Develop a global partnership for development

Heads of States committed to increase investment in human resources, agriculture, fisheries, forestry and rural development in all countries, and pledged to halve the number of hungry people by the year 2015 as a first step towards the achievement of food security for all. To achieve this goal, at least 27 million hungry people will need to become food secure annually (United Nations, 2008). The World Food Programme (2008) reported that raised food prices have a direct negative impact on five Millennium Development Goals (MDGs): MDG1 (prices could increase in the incidence of hunger and poverty); MDG2 (malnutrition could reduce school attendance and learners' performance); MDG 4 (there will be an increase in child mortality); MDG5 (no improvement in maternal health is likely to happen as food insecurity increases) and MDG6 (food insecurity could compromises the fight against HIV/AIDS and other diseases). Progress towards MDG1 is on track, except in sub-Saharan Africa where the number of people living on less than $1per day has not decreased and about one quarter of all children are still malnourished. It is suggested that the current economic crisis is due to a lack of investment in agricultural and rural development in developing countries (United Nations, 2008).

Agriculture is more than twice as effective in reducing poverty as growth in other sectors (World Bank, 2007). In most sub-Saharan African countries, agriculture contributes at least a third of GDP to the livelihood of 70-80 per cent of the population (AUC/NEPAD, 2003). In Africa, a 10 per cent increase in farm yields leads to at least a seven per cent decrease in poverty, but the same increase in farm yields in Asia only generates approximately a five per cent decrease in poverty (Irz at *al.,* 2001). Poultry is the most popular form of livestock production on the continent (Majake, 2005; Sonaiya, 2003).

2.1.1 The state of food security in Africa

NEPAD (2009) reported that Africa is characterised by a lack of sound economic growth; relatively low agricultural growth; an agricultural sector dominated by smallholders and subsistence households; a large population of chronically hungry people (approximately one third) and increasing food insecurity (AUC, 2005) as illustrated in Table 2.1.

Table 2.1 Prevalence of hunger in African Sub-Regions, 1990/92 (AUC, 2005 p3)

African Sub-Region	Number of persons under-nourished (millions)		Population under-nourished (percentage)		Percent change in 10 years
	1990/92	2000/02	1990/92	2000/02	
North	5.4	6.1	4	4	0
Central	22.7	45.2	36	55	+19
Southern	34.1	35.7	48	40	-8
West	37.2	36.4	21	16	-5
Africa	175.8	209.6	29	27	-2

African Heads of States met in Mozambique in 2003 and released the Maputo Declaration in which they pledged to formulate and implement policies for agriculture and rural development. They pledged to increase the budget allocation to agriculture by 10 per cent (from an average of four percent), before 2009, and endorsed the Comprehensive Africa Agriculture Development Program (CAADP) (AUC, 2005). Despite some pessimism regarding the contribution of smallholders to food security and poverty eradication, the 2007-2008 high food prices have reinforced the need for international support for CAADP's vision of promoting the productivity of smallholders as part of the agricultural sector (Wiggins, 2009). The CAADP has been featuring notably on major international and high-level agendas, including the outcomes of the 2009 World Summit on Food Security (FAO, 2009b; AU/NEPAD, 2009). Hendriks *et al*. (2009) demonstrated the spill-over effect of small-scale agriculture on people's livelihood as follows: increased agriculture productivity stimulates demand for agro-processing and non-agriculture services, including education, construction, transport, further stimulating demand for local products and higher investment in agriculture. As part of the commitment to achieve global food security, the 2009 World Summit on Food Security has declared a strong support for smallholder production (FAO, 2009b).

The CAADP includes four 'pillars of action' to increase agricultural productivity, food security and agricultural development. These pillars include:

- extending the area under sustainable land management and reliable water control systems
- improving rural infrastructure and trade-related capacities for improved market access
- increasing food supply and reducing hunger
- improving agricultural research, technology dissemination and adoption (AUC/NEPAD, 2003).

This third pillar corresponds to Millennium Development Goal one and has been developed into the *Framework for African Food Security* (FAFS) (NEPAD, 2009). This framework is biased towards people who are most affected by food insecurity and most vulnerable to shocks and risks affecting their livelihoods. The FAFS provides principles, recommended actions, coordination, peer review and tools to guide national and regional food security policies, strategies, investments, partner contributions and advocacy efforts to: improve risk management; increase the supply of affordable food; increase income opportunity for the vulnerable; and improve dietary diversity (NEPAD, 2009).

2.1.2 The state of food security in South Africa

South Africa has not yet undertaken a national study to estimate the prevalence of food insecurity in the country (Hendriks, 2005) even though the constitution enshrines food security as a basic human right. The Integrated Food Security Strategy (IFSS) includes priority actions to improve income-generation and job-creation opportunities; nutrition and food safety; analysis and information management systems; capacity building; and an increase in household food production and trading (National Department of Agriculture, 2002). From 2002, Statistics South Africa (Stats SA, 2008) has conducted a representative annual General Household Survey to monitor quality of life. The household's perception of hunger is included as an indicator of food security per age group with special attention to children under 18 years, but the questions included have varied form year to year, meaning that the data is not comparable across years. Reported hunger increased from 0.8 to 1.0 per cent, while the proportion of children who were not hungry decreased from 84.8 to 82.4 per cent between 2007 and 2008.

The 2005-2006 Income and Expenditure Survey indicates that food and beverages has the third largest share of household expenditure in South Africa over the survey period. The majority of the population spent more than 20 per cent of their total expenditure on food and beverages (Table 2.2).

Table 2.2 Share of household consumption expenditure (Stats SA, 2008 p3)

Main expenditure group	Percentage of annual household expenditure by population group				
	African	Coloured	Indian	White	Total population
Food, beverage and tobacco	22.8	20.9	10.5	8.5	15.6
Housing, water, electricity, gas and other fuels, furnishings, household equipment and routine maintenance of the dwelling	26.0	29.5	32.6	34.6	30.5
Transport and communication	20.8	21.5	28.4	25.7	23.4
Health, education, recreation and culture	7.7	7.8	9.0	9.7	8.7

KwaZulu-Natal has 11 ecological zones with relatively good rainfall and export facilities, and a growing economy that accounts for about 16 per cent of South African's agricultural production (Department of Agriculture and Environmental Affairs (DAEA), 2008). KwaZulu-Natal has 4000 commercial farmers and 400 000 rural farmers. Sugar cane is the most important crop, accounting for about 40 per cent of provincial agricultural revenue, followed by livestock (25 per cent) with beef cattle and poultry the most important livestock sectors valued at over R8 billion in 2006.

Poverty is concentrated in rural areas of KwaZulu-Natal, where households typically rely on government grants, subsistence agriculture and wages remitted by migrant workers (Swatson *et al.*, 2001). Maize is the staple food in KwaZulu-Natal and is grown by most rural households engaged in agriculture (Kirsten *et al.*, 1998). The seasonality of crop production and inefficient storage systems exacerbate hunger (Thamanga *et al.*, 2004). Kirsten *et al.* (1998) found that agricultural activities strongly contributed to household nutrition but only when production led to sales of surplus produce. Ngidi (2008) found that crop production was the second most important source of food for households in Umbumbulu and

Maphephetheni in KwaZulu-Natal. The bulk of food was purchased. Low-cost agricultural activities, such as small-scale poultry production, have the potential to provide meat, eggs and income throughout the year to mitigate household food insecurity (Wethli, 2003).

2.2 Measurement of food security

Depending on the objectives and/or the background of the researcher, the nature of the organisation and the objectives of the investigation, food security studies have been subject to a range of methods of measurement (Scherr & Vosti, 1993; Riely, 2000). Hendriks (2005) acknowledged complexities of and differences in food security measurements and lists four main methods of measurement, including: experiential tools; coping strategy assessment tools; household vulnerability approaches; and dietary diversity measures. The Millennium Development Goals measure the number of hungry people through the prevalence of malnutrition among children under the age of five years (United Nations, 2008). FAO (2008a) uses minimum dietary energy requirements (MDERs) or the amount of energy needed for light activity and a minimum acceptable weight for attained height.

The FAFS seeks to simultaneously achieve agricultural growth and food security, and measures vulnerability to risks and shocks through household assets; food access through own production and access to market; income level through self-employment such as farming, safety nets and other forms of employment; and nutritional adequacy through consumption of a diversity of foods, using the Household Dietary Diversity Score (NEPAD, 2009). (Fig 2.2.).

2.3 The state of poultry production in the world

As discussed earlier, agriculture is the main strategy rural households practise in the fight against food insecurity and poverty (World Bank, 2007). Poultry is a popular sector of rural agriculture and, often, the only livestock found in many rural households in developing countries (Majake, 2005; Sonaiya, 2003). Globally, poultry is usually the most affordable meat (with an almost stable price over the past four years) (FAO, 2008b). Poultry typically trades at a little over US$ 1000 per ton while a ton of pig, beef and ovine meat have averages below US$ 3000; above $3000 and around US$ 4000 respectively (Fig 2.3).

FAFS element	Indicator	Now percentage of population below critical level	-10	0	+10	Target percent of population below critical level
Improving risk management and resilience	Resilience score (based on assets)	_____ %				_____ %
Increasing the supply of affordable food	Proportion of expenditure spent on food	_____ %				_____ %
Increasing economic opportunities for the vulnerable	Per capita income	_____ %				_____ %
Improving dietary diversity	Dietary diversity score	_____ %				_____ %

Fig 2.2 Household food security score card.

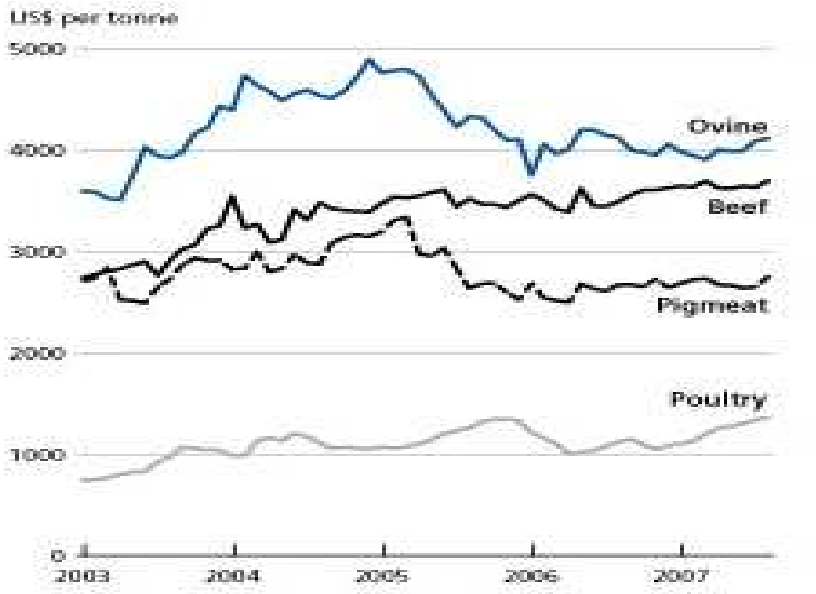

Fig 2.3 Global meat prices trend (FAO, 2007).

Given the strong growth in poultry demand, the annual value of poultry production rose by 37 per cent in 1961 to 53 per cent in 1991 (Gilin, 2001). In 2007, global poultry production represented 86 million tones, a two million increase compared with 2006 (FAO, 2008b). However, despite this worldwide popularity, poultry production has suffered an 18 per cent decline in 2006 due to Avian Influenza in 40 new countries in Africa, Europe and Middle East. Consumer confidence has improved and, in 2007, poultry production registered four per cent growth in Africa, 2.5 per cent in Asia and 5.3 per cent in South America (FAO, 2008b).

It has been projected that, between 2000 to 2015, the global demand for eggs will grow by 1.9 percent per year, with developing country demand growing at a projected 2.6 per cent per annum (Gilin 2001). The Food and Agriculture Policy Research Institute (FAPRI, 2007) has also predicted an increased popularity of poultry consumption and production in selected countries (Table 2.3). Table 2.3 indicates the difference between 2006 per capita poultry consumption and that projected by 2016, and ranges from 2.0 kilograms in India to about 48 kilograms per capita per year in the United States of America. Canada, China, Mexico, Russia and South Africa will need to import poultry products if demand and production growth continue as projected. China may need to import only 20 tons of chickens in 2006 but 500 tones by 2016. Russia appears to be the only country that will decrease its imported volumes by 2016.

Table 2.3 indicates that the annual production of chickens from eleven countries, including South Africa, will exceed one million by 2016. In developing countries, a large proportion of poultry production is smallholder production (70/80 per cent). This production has the potential to improve both household income and food security, and meet the rising demand of poultry, especially if farms are situated in peri-urban areas (Sonaiya *et al.* (1990).

2.3.1 A comparison of indigenous chickens with commercial layers and broilers

It is believed that the Khoi-Khoi were the first to keep a variety of indigenous chickens in Africa, followed by other black immigrants. Dutch and British immigrants introduced European and Asian chicken breeds (Nel, 1996). Indigenous chickens are more resistant to disease and are also called *local*, *ranging*, *traditional* and *family* chickens in literature and other names such as *Zulu* and *Venda* chickens in colloquial language (Wethli, 2003). They

scavenge feed that may include grains or cereals, insects, small reptiles, seeds, berries and green herbs (Nhleko *at al.*, 2003). Hens hatch and brood their chicks but their offspring are often not resistant to modern diseases such as Newcastle Disease (Wethli, 2003). In KwaZulu-Natal, rural people treat diseased chickens with chopped Aloe (*Aloe maculate*) leaves mixed with water to treat respiratory diseases; Icena (*Aloe greeni*) mixed in water to treat coryza; Mkhuhlu (*Tetradenia riparia*) or bark of Tambuti wood steamed and mixed with water for Newcastle Disease, and a drop a week of boiled vinegar and brown sugar in drinking water to prevent disease (Naidoo, 2003). However, local knowledge regarding indigenous chickens is neglected because researchers devote their work to exotic breeds, considering indigenous stock to be unproductive (Naido, 2003).

While indigenous layers are seasonal breeders, sitting on eggs for 21 days and producing up to 20 chicks per clutch in spring (this corresponds with periods of prolonged daylight and abundance of food which stimulate mating practices among chickens), commercial layers produce up to 300 eggs (about six eggs per week) during a laying, starting between 18 - 70 weeks. At the end of this production cycle, a commercial layer can also be force-moulted or made to renew the production cycle by temporarily removing feed, water and light for a period (Johnson, 2007). Genetics and other favourable conditions can be manipulated commercially to stimulate laying, including light (ten to sixteen hours of light a day), temperature, humidity, and feed and water routines.

Amberlink or Hy-Line and Lohmann are the most recommended commercial breeds found in South Africa. Commercial layers offer two business opportunities, namely the pullet rearing that sells point-of-lay pullets at the age of 18 weeks, and birds for egg production (Johnson, 2007; DOA, 2004). In their study on external quality of eggs from indigenous and commercial layers kept under the same artificial incubation environment, Nhleko *at al.* (2003a) found the weight of eggs from indigenous birds was on average 4g compared with 5g for commercial eggs. The colour of the eggshells was the same brown for both indigenous and commercial produce, but indigenous produce was not regular in shape and size. Eggs of odd shapes are likely to break when packed in standardized, commercial packaging.

Table 2.3 Current and projected chicken production and consumption in 23 countries (FAFRI, 2007)

	Consumption per person (Kgs/yr)			**Total consumption ('000 tons)**			**Population (Millions)**			**Actual Poultry Production ('000 tons)**				Surplus 2006	Surplus 2016
COUNTRY	2006	2016	Proj incr %	2006	2016	%	2006	2016		2006	2016		%	Tons	Tons
1. Argentina	28.2	33.5	15.8	1124	1454	22.6	39.86	43.4	8.1	1210	1576	366	23.2	86	122
2. Australia	35.8	39.5	9.3	725	862	15.8	20.25	21.82	7.1					-725	-862
3. Brazil	36	40.6	11.3	6780	8348	18.7	188.33	205.62	8.4	9280	11303	2023	17.8	2500	2955
4. Bulgaria	13.8	16.5	16.3	102	113	9.7	7.39	6.85	-7.8					-102	-113
5. Canada	29.8	31.3	4.7	985	1123	12.2	33.05	35.88	7.8	970	1054	84	7.9	-15	-69
6. China	7.9	10	21	10370	14031	26.0	1312.66	1403.1	6.4	10350	13476	3126	23.1	-20	-555
7. China Hong Kong	38.8	42.1	7.8	269	306	12.0	6.93	7.27	4.6					-269	-306
8. Egypt	6.4	7.3	12.3	507	676	25	79.22	92.6	14.4					-507	-676
9. EU-25	16.2	17.2	5.8	7405	7909	6.3	457.1	459.83	0.5	7425	8069	644	7.9	20	160
10. India	1.8	2	10	2000	2567	22.0	111.11	1283.5	91.3	2000	2567	567	22.0	0	0
11. Indonesia	3	3.6	16.6	688	933	26.2	229.33	259.17	11.5					-688	-933
12. Japan	15	15.6	3.8	1908	1954	2.3	127.2	125.26	-1.5	1195		-1195		-713	-1954
13. Mexico	28	31.8	11.9	3010	3808	20.9	107.5	119.75	10.2	2610	3293	683	20.7	-400	-515
14. New Zealand	35.3	38.6	8.5	144	171	15.7	4.08	4.43	7.9					-144	-171
15. Philippines	7.5	8.7	13.7	675	917	26.3	90	105.4	14.6					-675	-917
16. Romania	15.3	21.8	29.8	342	479	28.6	22.35	21.97	-1.7					-342	-479
17. Russia	16.4	19.7	16.7	2330	2662	12.4	142.07	135.13	-5.1	1080	1493	413	27.6	-1250	-1169
18. South Africa	24	31.1	22.8	1062	1309	18.8	44.25	42.09	-5.1	840	1032	192	18.6	-222	-277
19. South Korea	12.9	15.1	14.5	630	760	17.1	48.84	50.33	2.9					-630	-760
20. Taiwan	29.5	34.2	13.7	679	827	17.8	23.02	24.18	4.7					-679	-827

While it takes up to six months for indigenous chickens to reach a slaughter weight of 1.8 - 2.0kg (Okot, 1990), broilers reach this target in four to five weeks. Broilers are selected for their rapid growth potential and efficient feed conversion ratios (Johnson, 2007). Nhlelo e*t al.* (2003a) compared the growth of broilers with indigenous chicks under the same dietary treatments and found the food conversion ratios of the indigenous birds inferior, and not as profitable as commercial stock. Table 2.4 compares the indigenous and commercial poultry stock.

2.3.2 The state of the poultry market and skills constraints for small-scale poultry producers in South Africa

The South African poultry market is dominated by two producers, Rainbow and Astral, who produce respectively 4.1 million and 3.4 million broilers per week and together account for 55 per cent of poultry production in South Africa. Four medium-sized producers hold 15 per cent of the market, while small-scale production contributes 30 per cent of the total poultry market in South Africa (United State Department of Agriculture (USDA), 2007). In 2007, poultry production increased by 11 per cent and poultry represented about 15 per cent (US$ 2.1 billion) of gross value primary agriculture in South Africa (USDA, 2007). Despite a relatively weak position in the livestock market, preference for poultry is growing in South Africa, with the national demand for poultry products exceeding domestic production by an estimated 22 percent in 2000. It is expected to increase to 92 per cent by 2010 and by 192 per cent by 2020 (National Department of Agriculture, 2002).

To close the gap between local production and consumption, South Africa imports poultry products, mainly from Brazil (with 71.5 per cent of all imports) and Canada (11.7 per cent). South Africa increased its total import of poultry products between 2004 and 2005 by 24 per cent (USDA, 2006). To enable food accessibility for all, the South African government has adopted a free market economy system and does not control tariffs and prices for food items (Schmidt, 2005). However, given that cheaper imported poultry products (mainly from the United States of America), threatened the marketability of poultry products produced in South Africa (Gilin, 2001), government intervened by raising tariffs on poultry imports from the United States in the late 1990s to protected local producers (National Department of Agriculture, 2002). In 2005, the United States' application to have the tariffs reviewed was

strongly opposed by local producers, and government agreed to no revision before 2011 (USDA, 2007).

Egg consumption is increasing in South Africa. Per capita consumption in 2006 was 124 eggs per person per annum and this had increased by 9.7 per cent by 2005. With a production of 341.575 tonnes in 2006 (10.8 per cent increase from 2005 and 31 per cent increase is projected for 2007), and a turnover of R 3,8 billion in 2006, the South African egg industry generates the largest share of the animal product market (South Africa Poultry Association, 2007). Table 2.5 indicates that per capita consumption of poultry meat in South Africa is higher when compared with other meat, apart from the year 2002/03 when per capita consumption of red meat surpassed per capita consumption of poultry. Table 2.5 shows the total meat supply and consumption and per capita consumption in South Africa.

With many people in South Africa believing that poultry meat is healthier than red meat, poultry and eggs are among the foods preferred by health-conscious consumers (FAFPRI, 2007). Per capita consumption of poultry started to exceed per capita consumption of red meat from the year 1998/99 (USDA, 2006). Per capita poultry meat consumption will remain high compared with per capita consumption of beef and veal, and the price for poultry meat is predicted to be lower compared with beef and veal by the end of the period 2006-2016 (FAPRI (2007). However, in South Africa, the annual per capita beef consumption decreased from 26 kg to 13 kg from 1960 to 2005. During the same period, the annual per capita poultry consumption jumped from three to 22 kg per capita per year (South African Poultry Association, 2007).

Small-scale poultry production covers 30 per cent of the poultry market in South Africa. The majority of traders are informal, selling live birds in previously disadvantaged communities (Wynne and Lyne, 2003; USDA, 2007). Lack of poultry production skills; limited access to information on marketing and technical issues; limited extension service; and limited access to finance constrains the growth of this sector (Whynne and Lyne, 2003; Nsahlai and Uzodike, 2003). Alders and Pym (2008) assert that small-scale poultry production capacity building and training in the following is required: disease control; breed selection; balanced rations; housing; husbandry; and financial management. It can be concluded that there is a

huge market for poultry in South Africa, but small-scale production is limited because of, among other things, the lack of skills and of limited access to extension services.

Table 2.4 Comparison of indigenous and commercial chickens (Adapted from Alders and Spradbrow, 2001; Alders and Pym, 2008 p2)

Feature	Indigenous chicken	Commercial chickens
Labour inputs	Minimal	Considerable
Housing	Trees, chicken houses of local material; inexpensive	Chicken unit using conventional material; expensive
Nutrition	Scavenging feed resource base, leftover feed, cereals, no supplements; inexpensive	Balanced commercial ration; expensive
Water	Well water, used water, natural sources	Clean water supply essential
Production	Low; could improve with better nutrition, disease control and shelter from predators	High; but require a high level of input
Meat quality	Little fat; pleasant flavour; preferred texture	More fat; less flavour; poor texture
Adaptability	Good; good flight skills, more likely to escape predators. Can scavenge for own food	Limited; poor flight skills, easily caught by predators, less skilled at scavenging
Veterinary input	None; Newcastle; HPAI and Fowl Cholera vaccination in some countries	Control of many viral, bacterial and parasitic diseases essential for efficient promotion
Environmental impact	Minimal: can be positive trough provision of organic fertilizer and pest control	Negative: intensive production of cereals for rations; occasional improper use of antibiotics, excess ammonia production
Training requirement	Basic: Newcastle Disease control, Fowl Cholera control (in part of Asia), poultry husbandry and management	Considerable: wide ranging disease control; breed selection; use of balanced ration; good housing; husbandry; financial management

2.3.3 Food security and other potential socio-economic benefits of village poultry production

Few studies have investigated the socio-economic benefits of small-scale poultry production. Sparse available findings suggest that small-scale poultry production is economically viable; empowers women; increases household income and improves food security (Ahuja *at al*, 2008). Poultry products have also been utilised as capital and barter products in areas where

currency is not available (Sonaiya *et al*, 1990; Guèye, 2008). The contribution of small-scale poultry production to household food security cannot be limited to animal protein consumption, because producers can also use money obtained from this enterprise to purchase other foods and meet other household needs (Guèye, 2008). Rahman (2008) has investigated the critical role of small-scale poultry production in Bangladesh and found that poultry has improved the frequency of household food consumption. Rahman (2008) reported that poultry production decreased the number of months during which households ate less than three meals a day from 3.5 to 2.9 months. Karim *et al.* (2005) reported that, in Bangladesh, small-scale poultry production increased household expenditure on education, clothes and productive assets and savings.

Guèye (2008) demonstrated that village poultry has the potential to achieve food security, create employment; increase gender equality; alleviate poverty and increase people's well-being in the process (Fig 2.4).

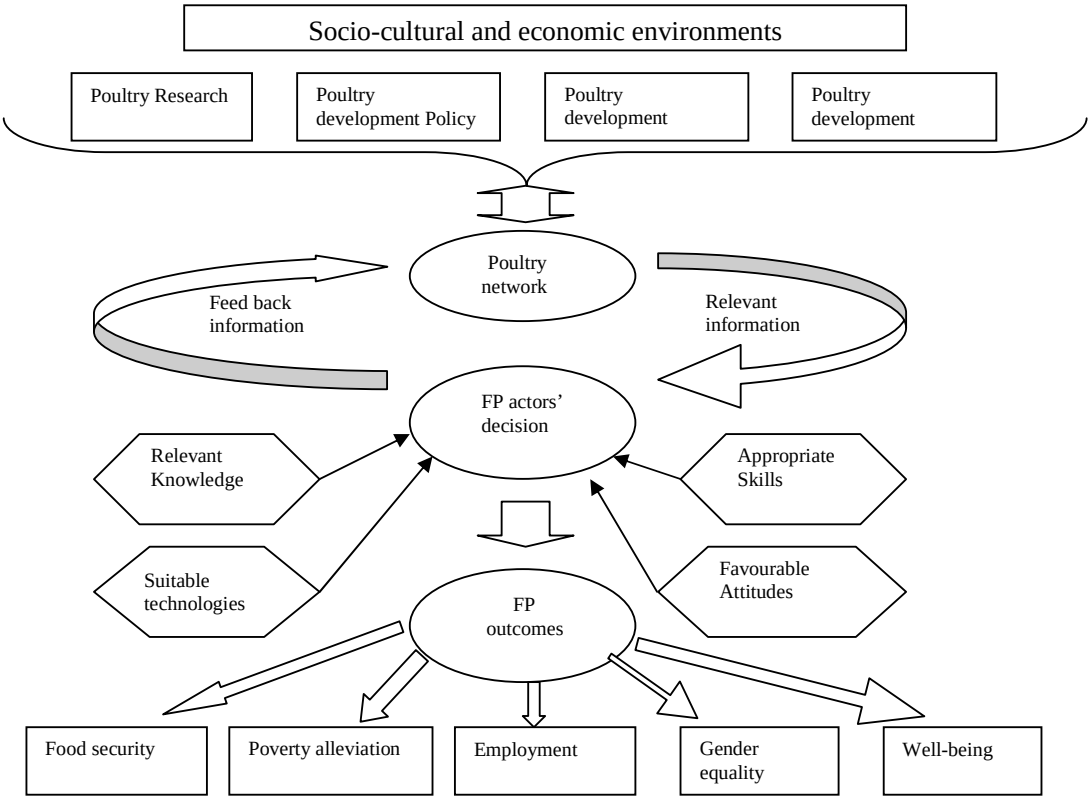

Fig 2.4 Socio-economic outcomes of sound family poultry networks (Guèye, 2008 p5).

Table 2.5 South African total meat supply, per capita consumption and price (FAFPRI, 2007)

Broiler	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Consumption (Thousand Metric Tons)	1062	1070	1093	1120	1144	1162	1184	1213	1246	1278	1309
Local production	840	822	835	859	885	909	933	957	982	1008	1032
Local production gap	-222	-248	-257	-261	-258	-253	-251	-256	-264	-270	-277
Per capita consumption (Kg)	24.0	24.3	25.0	25.7	26.4	27.0	27.6	28.4	29.3	30.2	31.1
Retail price/Kg	17.84	17.90	19.58	20.93	22.16	23.07	24.00	24.98	26.03	27.10	28.11
Beef											
Consumption (Thousand Metric Tons)	683	697	714	730	748	763	776	791	809	825	841
Local production	660	649	649	657	668	678	691	707	725	745	766
Local production gap	-23	-48	-65	-73	-80	-85	-85	-85	-84	-80	-76
Per capita consumption (Kg)	15.5	15.8	16.3	16.8	17.3	17.7	18.1	18.5	19.0	19.5	20.0
Farm price/Kg	51.43	54.94	57.91	61.33	63.36	64.65	67.35	70.63	74.43	78.30	82.6

Given its high socio-economic benefits, small-scale poultry production can alleviate poverty and has potential as a useful development tool (Guèye, 2008). A summary of the benefits are presented in Table 2.6.

Table 2. 6 Estimated per capita consumption and prices of poultry, beef and veal in South Africa (2006-2016), (FAPRI, 2007).

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Kg per capita										
Beef and veal	15.5	15.8	16.3	16.8	17.3	17.7	18.1	18.5	19	19.5
Broiler	24	24.3	25	25.7	26.4	24	27.6	28.4	29.3	30.2
Price / Rand										
Beef and veal	51.43	54.94	57.91	61.33	63.36	64.65	67.35	70.6	74.4	78.3
Broiler	17.84	17.9	19.58	20.93	22.16	23.07	24	25	26	27.1

This chapter has reviewed literature regarding the state of food (in)security in the world and South Africa. The increase in global food prices, observed since 2005, has pushed over 100 million more people into food insecurity since 2008. The crisis threatens progress towards the MDGs and especially eradication of hunger and poverty (MDG1) (table 2.7). Reference has been made to the role small-scale poultry production can play to improve food security.

Table 2.7 Poultry's potential contribution to the Millennium Development Goals (Alders and Pym, 2008 p8)

Millennium Development Goal	Village poultry contributions
1: Eradicate extreme poverty and hunger	Improved village poultry generates income and improves food security
2: Achieve universal primary education	Village poultry products sold to pay school fees for the children and for poor households
3: Promote gender equality and empower women	Improved village poultry production has empowered poor women (as reviewed by Alders and Pym Bagnol, 2001; Dolberg, 2003)
4: Reduce child mortality	Village poultry products provide high quality nutrients, income for poor households and education for women on balanced diets. Disease control for poultry can be related to family health and wellbeing (as reviewed by Alders and Pym 2008; Alders *at al*, 2007a)
5: Improve maternal health	As for number 4 above
6: Combat HIV/AIDS, malaria and other diseases	Village poultry provides high quality nutrients for the ill, can be sold to purchase medicines and requires little labour (Alders *et al*, 2007b)
7: Ensure environmental sustainability	Village poultry contributes to pest control, provides small quantity of manure for vegetable and crop production and consumes local feedstuffs that are frequently unsuitable for human consumption (as reviewed by Alders and Pym Alders and Spadbrow, 2001)
8: Develop a global partnership for development	Globally, partnerships have developed among those working with village poultry (the International Network for Family Poultry Development, the Asian Pacific Federation Working Group on Small-scale Family Poultry farming, the Danish Smallholder Poultry Network and the International Rural Poultry Centre) with other development and conservation organisations (as reviewed by Alders and Pym Alders, 2004).

CHAPTER 3
METHODOLOGY

3.1 Background to the study area

Maphephetheni is located on the Umgeni river and near Inanda dam, 50 km north and 80 km west of Durban (Struck, 2002), forming part of the 'Valley of a Thousand Hills', in the eThekwini Municipality, KwaZulu-Natal. Maphephetheni is divided into two areas, namely the uplands and lowlands. Together, these areas are home to approximately 16 000 people living in 2 000 homesteads. While the Maphephetheni uplands are situated on a plateau, between 200 and 600 metres above sea level, the Maphephetheni lowlands are adjacent to the dam. The lowlands have a higher population density (Green and Erskine, 1999).

Maphephetheni has good quality gravel access roads and a tarred road, traversing both areas that link Maphephetheni to Durban and Pietermaritzburg. The local infrastructure includes schools, clinics and small shops. Subsistence agriculture is practised. *Inkosi* (Chief) Gwala heads the Maphephetheni traditional authority and together with *Indunas* (Headmen) form a representative council. There are eight *Indunas*, each in charge of one of the eight sub-wards. The Maphephetheni lowlands, where this study was conducted, has five sub-wards. The average income of participating households was R2035.75 per month, with social grants providing the highest proportion of income. Most household heads were females with primary school education.

3.2 Sample selection

A meeting with the traditional authority took place at the start of this study, to mobilise the community and explain the objectives of the study. The Researcher was trained at the KwaZulu-Natal Poultry Institute, on poultry rearing and management. The design for the cages was obtained from Dynamic Automation, Hammarsdale, KwaZulu-Natal.

Forty households were selected in the Maphephetheni lowlands, for a trial to assess the performance of egg and broiler production, both in term of production and marketability. To

ensure representativeness, an equal number of households was selected from each of the eight sub-wards. The *Induna* (Headman) of each ward, delegated by the Chief, used accidental sampling in his ward, interacting with available people he met, until the 8th household was included. The criteria for a household to be included in the sample, were interest in participating in the planned activities, and the availability of a place to keep birds (Table 3.1). In one sub-ward, none of the sampled households met these criteria. The 40 sampled households were divided into two groups of 20 households each. The first 20 households were each given 12 point-of-lay pullets, and the second 20 households were each given 12 three-week old chicks brooded by the University of KwaZulu-Natal's Ukulinga Research Farm, and vaccinated for Newcastle disease and Infectious Bursal Disease. Other inputs provided were 48 cages (Figure 3.1) that each accommodated, on average, five layers, feed and drinking and feeding equipment. The layer and broiler groups divided themselves into four groups each. Each group agreed to pool their stock at one group member's house. The groups developed a duty roster. The researcher and the Chief's Agriculture Assistant facilitated the process of organising households into groups.

Figure 3.1: Birds in the cages built for the project

Table 3.1 Sub-ward with corresponding poultry activity in Maphephetheni, 2008

Sub-ward	**Broilers**	**Layers**	
Kwavutha	X	X	No place to house birds
Mbozamo	X	House1	No interest in looking after broilers
Ingcukwini	House 1	House 2	
Bhekuphiwe	House 2 and 3	House 3	
Mkkangeni	House 4	House 4	

The description of each group is as follows:

HyLine point of lay pullets were ordered and 239 birds were placed with the community on the 17th of September 2008 (Figure 3.2) as follows:

- House 1: eight households with 95 point-of-lay pullets
- House 2: four households with 48 point-of-lay pullets
- House 3: four households with 48 point-of-lay pullets
- House 4: four households with 48 point of-lay pullets.

Figure 3.2: Training on poultry production at Maphepheteni

A total of 480 broilers was delivered and placed with the community groups on the 25th of October (240) and 1st of December 2008 (240) respectively. Participants received an equal number of birds at each placement, as follows:

- House 1: eight households with 96 broilers
- House 2: four households with 48 broilers
- House 3: four households with 48 broilers
- House 4: four households with 48 broilers.

3.3 Data collection

Before the trial, a survey was conducted to collect information on household demographics and the socio-economic benefits expected by participants in the project. The study also collected weekly information on household food consumption (and poultry consumption in particular). This information was collected through a structured questionnaire (Appendix A). The survey collected the data necessary for estimating the Household Dietary Diversity Score (HDDS) to indicate food security. The Researcher visited each household and interviewed the person who typically prepared meals. Respondents reported consumption on the previous seven days of

foods derived from the FAO (2008c) dietary Diversity Score foods list. The Dietary Diversity Score was calculated by scoring consumption of each food group as one (1) (if at least one food in the food group was consumed during the previous seven days) or zero (0) (if no food from the food group was consumed during the previous seven days) (following FAO, 2008c). The Dietary Diversity Score is usually categorised into terciles: low dietary diversity (consumption of 1-3 food groups); medium diversity (consumption of 4-5 food groups); high diversity (consumption of 6 or more food groups) (FAO, 2008c).

Prior to the survey, a group discussion was held, to test and adjust the questionnaire. The discussion included five interested participants from the neighbouring Maphephetheni uplands. A second survey was conducted during the production period (trial) to determine the potential market for poultry in the Maphephetheni lowlands. This survey also used a structured questionnaire (Appendix B).

Figure 3.3: A participant explaining the group's analysis at the Sustainable Livelihoods Workshop

A short training on basic poultry production was organised for sampled households before the trial (Figure 3.2) and a workshop on sustainable livelihood analysis (Figure 3.3) was facilitated during the production period. Monitoring of households was conducted five days a week during the production period, to support, improve household knowledge, monitor attitudes and poultry production practices, adjust production methods, and collect data regarding the performance and impact of the production. Quantitative information was collected with the use of poultry performance record cards (Appendices C, D, E, F and H). This study was carried out during a four month period (September - December 2008). Table 3.2 summarises sub-problems of this study, data collected and analysis applied.

Table 3.2 Study sub-problems, data collected and analysis used

Sub-problem	Data collected	Analysis
1. Do the sampled households have poultry- production skills?	Previous experience with poultry production.	No analysis was required
2. Is there a market for poultry products in and around the Maphephetheni Lowlands ?	Price, amount and frequency of chicken and egg sales in and around Maphephetheni	Arithmetic, Descriptive statistics.
3. What are the socio-economic benefits that poultry production can generate in Maphephetheni lowlands?	List of actual and potential benefits from households.	No analysis was required
4. What are the costs and other requirements, for the establishment of poultry production in Maphephetheni lowlands?	List of inputs and other requirements, to establish small poultry production	Arithmetic, Descriptive statistics.
5. Can poultry production contribute to increase dietary diversity and poultry consumption in Maphephetheni lowlands?	Frequency of food group consumption by households	Household Dietary Diversity Score. Descriptive analysis (frequencies, comparison of means)

3.4 Data analysis and treatment

Microsoft Excel was used to analyse the data, regarding the price of chickens and eggs sold by households, number and frequency of chickens and eggs sold, and production performance (egg production rate, egg weight, birds' weight and mortality rate). The Statistical Package for Social Sciences (SPSS) version 15.0 was used to describe basic demographics and analyse information collected regarding Household Dietary Diversity Score and poultry consumption. Basic demographic statistics are reported using frequencies and descriptive statistics. The Dietary Diversity Score was comprised of the following 16 food groups: staple cereals; vitamin A rich vegetables and tubers; white tubers and roots; dark green leafy vegetables; other vegetables; vitamin A rich fruits; other fruits; iron rich organ meat; flesh meats; eggs; fish; legumes; nuts and seeds; milk and milk products; oil and fats; sweets; spices, condiments, beverages. Poultry consumption comprised chickens and eggs.

Chi-Square tests were used to compare the Dietary Diversity Scores, to show percentage of sampled households consuming different food groups during both phases of the survey, and to investigate the association between demographic variables and the consumption of each food group. Independent Sample Paired *t*-tests were used to compare the means of weekly consumption frequencies of chicken and eggs and a Paired *t*-test was used to compare weekly consumption of chickens and eggs.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Poultry production skills in Maphephetheni lowlands

The meeting with the local traditional leadership, held at the beginning of the study, established that commercial poultry production had not been practised in the Maphephetheni lowlands, and household members did not have the relevant skills to manage such production. Therefore, basic poultry production courses were organised for study participants. Egg production training took place on the 16th September 2008 (Figure 3.2). Twenty households received point-of-lay pullets on the 17th September 2008. Broiler production training took place on the 23rd October 2008. Twenty households received two batches of broilers on the 25th October and 1st of December 2008. The setting up of facilities took place the following day of training and households received ongoing technical assistance during the study period, and acquired necessary skills as they practised production skills, marketed poultry products, and managed money.

4.2 Market for poultry products in and around the Maphephetheni lowlands

Household members indicated that poultry was the most commonly consumed meat in the community, and poultry products were purchased from a supermarket outside of the Maphephetheni lowlands. This provided an opportunity for local chicken production. The demand for poultry was confirmed, in that sample households that kept broilers, were asked by fellow community members to sell live chickens from as early as four weeks. However, households preferred to keep birds up to six weeks of age to fetch a higher price per bird. While the market price for live birds was R15/kg at the time of the study, households sold birds (without weighing them) at an average price of R40 per bird.

A survey was conducted to assess markets that targeted traders selling live birds, at the nearest poultry market in Inanda (about 10km away). It was established that there were only two poultry traders, namely Mr DB Thokozane and SM Msomi, in Inanda. These traders occasionally sent hawkers to sell live chickens in the Maphephetheni lowlands, but also sold to customers located

as far away as Umlazi (20 km south of Durban) and beyond. Traders indicated that they sold approximately 2000 birds a week during good seasons. These traders reported a shortage in the supply of birds for the last two years, confirming the demand for poultry. One of the traders purchased broilers from participants in this study (Figure 4.1).

Figure 4.1: A hawker buying birds.

Households keeping commercial layers, sold eggs to neighbours and school children. However, commercial eggs are sorted and sold in sizes according to the following South African standards: jumbo (over 66g/egg), extra large (59-66g), large (51-59g), medium (43-51g) and small (33-43g). To maximise profits, participants were encouraged to package and sell eggs according to their size. Local shops in the Maphephetheni lowlands generally sell eggs of medium size. This forced households to sell their eggs (of any size) at local market medium size prices, as local consumers are not alert enough to the relationship between egg size and price. Given that egg production towards the end of the laying season drops, but egg size increases, households were not benefiting from differential pricing (Hy-Line, 2008).

A higher demand for live birds, rather than eggs, was established, and it was concluded that a market exists for poultry production in Maphephetheni lowlands.

4.3 Socio-economic benefits that poultry production can generate in the Maphephetheni lowlands

The sustainable livelihoods workshop facilitated on the 30th of October 2008, stimulated debate and reflection on the actual and potential socio-economic benefits of poultry production. Participants were asked, for example, to identify their assets, and existing opportunities to sustain production, when the project funding ended. Households reported the desire to have their own

poultry production, and some expressed a preference for working together in a large poultry production unit.

During the workshop, it was found that participants did not see the birds and eggs as sources of food for domestic consumption, but rather as a source of income that, in turn, could help them purchase other foods. Money generated from the sale of eggs and birds was not distributed to households, but kept by a designated group member responsible for the day-to-day bookkeeping and ordering of feed for the group.

Figure 4.2: A new poultry house.

Some participants organised themselves into a *stokvel* (rotating credit club) to lend money to members, who paid back R30 interest per R100 borrowed, over a period of three months. Borrowing members have indicated that they borrowed money to cover costs, including food, and to access other basics needs, including education for their children.

Some participants built new houses to place the birds in (Figures 4.2 and 4.3) as the previous houses were not initially intended for birds. Households had to avail their own houses or kitchens to house cages for commercial layers and broilers. Shavings were spread on the floor of the chicken houses to assist with cleaning and insulation.

Figure 4.3: Poultry house built by the participants.

It also emerged from this workshop that broiler production was preferred to egg production, and the households expected to benefit from scaled-up production. Finally, households were asked to measure the potential benefits against

the Millennium Development Goals (MDGs). These benefits, as perceived by households, were outlined as:

MDG1. Eradicate extreme poverty and hunger: If broilers were to be supplied regularly or produced locally, broiler production could generate income, as local people prefer live chickens, and producing households will have money to purchase groceries and other essential foods and items, that will diversify their diets and improve food security. Therefore, households have indicated that they consider poultry production as self-employment.

MDG2. Achieve universal primary education: children's education-related expenditure was one of the motives for households to borrow money from the *stokvel.*

MDG3. Promote gender equality and empower women: of 40 households benefiting from this project, only two were represented by men. Women are predominantly involved in food production in Maphephetheni lowlands.

MDG4. Reduce child mortality and MDG5. Improve maternal health: this project has provided high quality food, and some income, for households. The importance of nutrition and disease control for poultry and humans was highlighted in basic poultry production training, and understood by households. The application of this knowledge can improve household health and reduce child mortality.

MDG6. Combat HIV/AIDS, malaria and other diseases: the project has provided high quality food for the households. Income could be used to purchase medicines. Poultry is generally seen as an agricultural activity with low labour requirements, and may provide weaker household members with a productive activity.

MDG7. Ensure environmental sustainability: households have obtained manure from chickens, and used this for vegetable production.

4.3.1 Economic evaluation

While the market price in the community for live birds was R15/kg during the study period, participants sold birds without weighing them, at an average price of R40 per bird (the price for a bird weighing a live weight of 2.66 kg at R15/kg except that the birds weighed less than 2.66kg), which was advantageous. Birds were on average 42 days of age when sold.

Figure 4.4: One of the participants providing water for the birds.

The first placement (25th October 2008) allowed each household to make an average net income of R234.31 (11.5% increase in household income) and production, although below commercial targets (Tables 2, 3, 4 and 5), was considered good, when taking into account that production was not under commercial conditions, and that the birds were below target weight when placed. Commercial targets used were for the Ross 308 hybrid (2007 Management Manual). Mortality was low, indicating that commercial broiler stock, that has been brooded and vaccinated against prevalent diseases, perform well under the prevailing conditions.

Table 4.1 Technical and economic performance of the first broiler placement (n=96) in House no. 1 (8 households)

Age (d)	No. of birds	Mor-tality	Ross target body weight (g)	Ave body weight (g)	Economic evaluation	
21	96		874	815	Average bird price (R/bird)	40
28	94	2	1412	1328	Total birds sold	93
35	93	1	2021	1856	**Income**	**3720**
42	93	0	2652	2470	Expenditure (R) (electricity)	50
					Feed	400
					Birds @ R13 per bird	1248
					Net income	**2022**
					Average household net income (R)	252.75

Table 4.2 Technical and economic performance of the first broiler placement (n=48) in House no. 2 (4 households)

Age (d)	No. of birds	Mor-tality	Ross target body weight (g)	Ave body weight (g)	Economic evaluation	
21	48		874	833	Average bird price (R/bird)	40
28	47	1	1412	1398	Total birds sold	41
35	44	3	2021	1874	**Income**	**1640**
42	41	3	2652	2423	Expenditure (R) (electricity)	50
					Feed	200
					Birds @ R13 per bird	624
					Net income	**766**
					Average household net income (R)	191.5

Table 4.3 Technical and economic performance of the first broiler placement (n=48) in House no. 3 (4 households)

Age (d)	No. of birds	Mort.	Ross target body weight (g)	Ave body weight (g)	Economic evaluation	
21	48		874	886	Average bird price (R/bird)	40
28	48	0	1412	1347	Total birds sold	46
35	47	1	2021	1885	**Income**	**1840**
42	46	1	2652	2499	Expenditure (electricity)	50
					Feed	200
					Birds @ R13 per bird	624
					Net income	**966**
					Average household net income (R)	241.5

Table 4.4. Technical and economic performance of the first broiler placement (n=48) in House no. 4 (4 households)

Age (d)	No. of birds	Mort.	Ross target body weight (g)	Ave body weight (g)	Economic evaluation	
21	48		874	833	Average bird price (R/bird)	40
28	47	1	1412	1398	Total birds sold	47
35	47	0	2021	1874	**Income**	**1880**
42	47	0	2652	2423	Expenditure (R) (electricity)	50
					Feed	200
					Birds @ R13 per bird	624
					Net income	**1006**
					Average household net income (R)	251.5

The second placement (1 December 2008) also resulted in a market price of R40/bird, and birds were again marketed at 42 days of age. Average household net income increased slightly from the first placement, and in some cases birds performed better than commercial targets (Tables 6, 7, 8 and 9).

Table 4.5 Technical and economic performance of the second broiler placement (n=96) in House no. 1 (8 households)

Age (d)	No. of birds	Mort.	Ross target body weight (g)	Ave body weight (g)	Economic evaluation (Rands)	
21	96		874	822	Average bird price (R/bird)	40
28	95	1	1412	1336	Total birds sold	93
35	94	1	2021	1869	**Income**	**3720**
42	93	1	2652	2787	Expenditure (R) (electricity)	50
					Feed	400
					Birds @ R13 per bird	1248
					Net income	**2022**
					Average household net income (R)	252.75

Table 4.6 Technical and economic performance of the second broiler placement (n=48) in House no. 2 (4 households)

Age (d)	No. of birds	Mort.	Ross target body weight (g)	Ave body weight (g)	Economic evaluation (Rands)	
21	48		874	842	Average bird price (R/bird)	40
28	48	0	1412	1344	Total birds sold	48
35	48	0	2021	1847	**Income**	**1920**
42	48	0	2652	2466	Expenditure (R) (electricity)	50
					Feed	200
					Birds @ R13 per bird	624
					Net income	**1046**
					Average household net income (R)	261.5

Table 4.7 Technical and economic performance of the second broiler placement (n=48) in House no. 3 (4 households)

Age (d)	No. of birds	Mort	Ross target body weight (g)	Ave body weight (g)	Economic evaluation (Rands)	
21	48		874	812	Average bird price (R/bird)	40
28	45	3	1412	1321	Total birds sold	43
35	44	1	2021	1862	**Income**	**1720**
42	43	1	2652	2402	Expenditure (R) (electricity)	50
					Feed	200
					Birds @ R13 per bird	624
					Net income	**846**
					Average household net income (R)	211.5

Table 4.8 Technical and economic performance of the second broiler placement (n=48) in House no. 4 (4 households)

Age (d)	No. of birds	Mort	Ross target body weight (g)	Ave body weight (g)	Economic evaluation (Rands)	
21	48		874	851	Average bird price (R/bird)	40
28	48	0	1412	1390	Total birds sold	46
35	48	0	2021	2012	**Income**	**1840**
42	46	2	2652	2493	Expenditure (R) (electricity)	50
					Feed	200
					Birds @ R13 per bird	624
					Net income	**966**
					Average household net income (R)	241.5

The average net income for each household in the second placement of broilers was R241.81/month (an increase of 11.87% of household income) and the average mortality rate was 4.4%. Production improved in the second round for houses one, two and three, but house three showed a loss per participating household. The experience gained through the first round seemed to help participants manage the second round better on the whole. The average weight gain per bird was 5.7% higher in the second placement (average weight = 1705.25 g) than the first placement (average weight = 1612.00 g).

Commercial egg production typically continues for about 50 weeks after commencement of laying. Therefore, the current economic evaluation for the layers covered the trial period and the projected egg production at the end of production trial at 70 weeks, as per the breed standards (Hy-line management manual 2008). Birds in all the houses took longer than expected to begin egg production, which was probably due to stress from the change of environment, as birds were placed at 23 weeks of age and not earlier, which would have been more suitable. However, production reached the commercial targets within two weeks.

In layer house one there was a drop of production from week 29 to 31 which is probably due to a lack of feed or water as the production bounced back from week 31 (Figure 4.5).

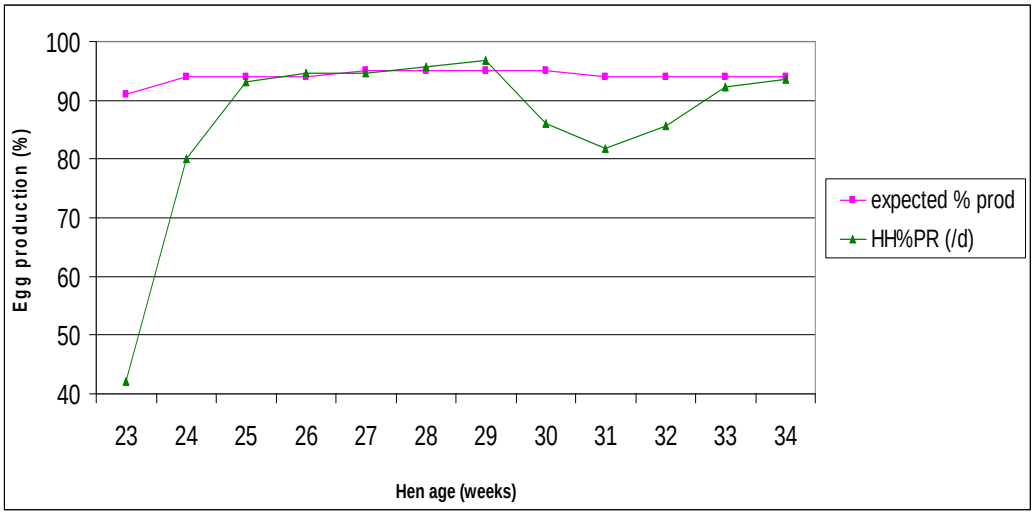

Figure 4.5. Expected and actual egg production of Hy-line layers placed in House no. 1 (8 households).

Egg weights also reached targets (Figure 4.6), but the market needs to recognise and charge per egg size, to maximise net income.

There were 95 layers placed in hen house No 1, managed by representatives from eight households. This hen house showed a total production of 6894 eggs, sold at R0.83 per egg (average egg price) that generated an estimated income of R5722.02 (Table 10). Electricity represents the only expenditure in the current economic analysis, although feed and tray costs were included for the projected analysis. This brings the total net income for house No 1 to R5522.02. If projected to the end of layer production cycle at 70 weeks, the accumulated

number of expected eggs per week was 27944 eggs in total. Projected egg production was calculated using the expected egg production for each age until 70 weeks, and the number of birds producing eggs from the expected mortality from the Hy-Line targets. There was no layer mortality during the study period.

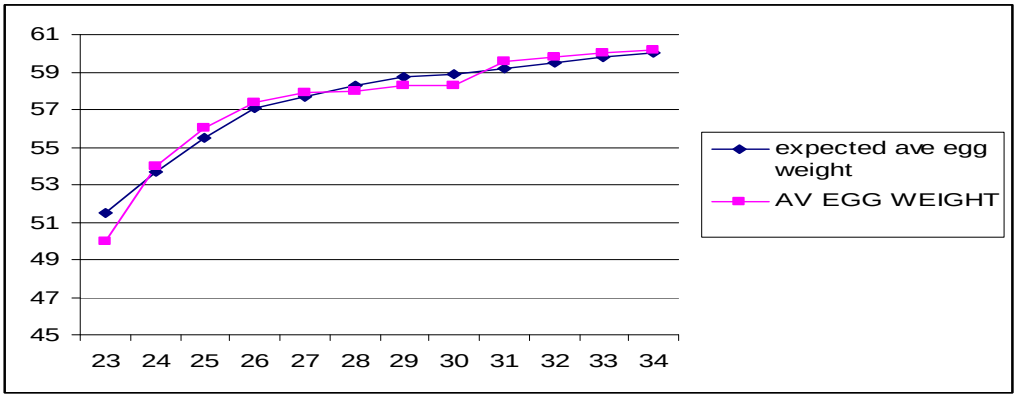

Figure 4.6. Expected and actual egg weight from Hy-line layers in house 1 (8 households).

If the average price of the eggs remains constant (at R 0.83 per egg), 27944 eggs will bring in an income of R23194.21 by the end of lay. The difference between the income and expenditure would bring the households' net income to R9068.12. However, given that house number one brings together eight households, the net income for an individual household at the end of production, is R1133.51 per production cycle. Seventy weeks represents 18 months. Therefore, each household would obtain a monthly net income share of R62.97. To put this into perspective, this would only buy one bag of maize-meal (R50) and the return bus fare to the nearest supermarket at Inanda (R16). However, households would have to sell culled birds at the 70th week (at the local price of R25 per bird), bringing in additional net income of R296.87 per household per production cycle (R25 X 95 birds/8 households).

An estimation of the risk (the difference between the expected and actual number of eggs) regarding income generation under hen house one was undertaken. According to the Hy-Line (2008) standard, 7462.7 eggs were expected, but the actual egg number produced was 6894. This means a decrease of 7.6 per cent of the optimal output and was probably due to the factors explained earlier (relocation and settling of the birds). If the output remains constant, hen house

one would lose R1762.75 due to the reduction in output. In this case, the net income at 70 weeks would be R7305.37, bringing the average household net income per household per month to R107.43 (7305.37/8 households/8.5 months). It can be concluded that egg production is technically feasible.

Table 4.9. Actual and projected income from layer house 1 (n=65)

Description	**Rands**
Average egg price (Rands/tray of 18)	15.00
Average egg price	0.83
Total production to date (number of eggs)	6894
Income	**5722.02**
Expenditure(electricity) (50x4 months)	200.00
Net income to date	**5522.02**
Expected Total production @ 70 weeks	27944.83
Expected Income @70 weeks	23194.21
Expenditure @ 70 weeks	
Trays	368.58
Feed	13320.00
Electricity (R50 X 8.75 months)	437.5
Total expenditure @ 70 weeks	**14276.08**
Net income/ @ 70 weeks	**9068.12**
Net income @ 70 weeks / 8 household	**1133.51**
Average household Net income/month	**129.54**

There were 48 layers placed in hen house No 2. At the end of the study, house No 2 showed a total production of 3512 eggs, sold at R0.83 (average egg price) that would bring an estimated income of R 2914.96 (Table 11). However, as applied in house No 1 above, a projection of the production was performed, to the end of the egg production cycle (at 70 weeks). If the average price of egg remains constant (at R 0.83), 14119.5 eggs will bring an income of R11719.18. The difference between this income and expenditure brings the households' net income to R4437.7. However, given that this hen house brings together four households, the net income for an individual household at the 70th week, is R1109.34, or a monthly net income of R130.51 per

household. An additional R300 per household per production cycle would be generated through sale of the culled birds (R25 X 48 birds/4 households).

The production performance for layer house No 2 started with a delay in egg production, reducing the output by 35.7 per cent. Production improved at the 25th week, and remained close to expectation during the rest of the study period. The dip in this house could be due to the same reasons of stress, from the change of environment.

Table 4.10 Actual and projected income from layer house 2 (n=48)

Description	**Rands**
Average egg price (R/tray)	15
Average egg price (R/egg)	0.83
Total production to date	3512
Income	**2914.96**
Expenditure(electricity) (50x4 months)	200
Net income to date	**2714.96**
Expected Total production @ 70 weeks	14119.5
Expected Income @70 weeks	11719.18
Expenditure @ 70 weeks	
Trays	184.29
Feed	6660
Electricity (R50X 8.75 months)	437
Total expenditure @ 70 weeks	**7281.79**
Net income/ @ 70 weeks	**4437.39**
Net income @ 70 weeks / 4 households	**1109.34**
Average household Net income/month	**130.51**

There were 48 layers placed in hen No 3. Production also dropped initially, but reached expectations by the 25th week. At the end of the study, house No 3eported a total production of 3411 eggs, sold at R0.83 (average egg price) that would bring an estimated income of R 2831.13

(Table 12). With electricity representing the only expenditure the household had to cover in this economic analysis, the net income is R2631.13. However, as applied in previous houses, a projection of the production has been done up to the end of the egg production cycle (at 70 weeks) and gives a total of 13589.9 eggs. There were two mortalities in this house. If the average price of eggs remains constant (at R 0.83), 13589.9 eggs will bring an income of R11279.61. The difference between this income and expenditure brings the households' net income to R3997.82. Given that this hen house brings together four households, the net income for an individual household at the 70th week is R999.45, a monthly net income of R117.58 per household. An additional R300 per household per production cycle would be generated through sale of the culled birds (R25 X 48 birds/4 households).

Table 4.11 Actual and projected income from layer house 3 (n=48)

Description	**Rands**
Average egg price (R/tray)	15
Average egg price (R/egg)	0.83
Total production to date	3411
Income	**2831.13**
Expenditure(electricity) (50x4 months)	200
Net income to date	**2631.13**
Expected Total production @ 70 weeks	13589.9
Expected Income @70 weeks	11279.617
Expenditure @ 70 weeks	
Trays	184
Feed	6660
Electricity (R50X 8.75 months)	437.5
Total expenditure @ 70 weeks	**7281.79**
Net income/ @ 70 weeks	**3997.82**
Net income @ 70 weeks / 8 households	**999.45**
Average household Net income/month	**117.58**

There were 48 layers placed in hen house four. The production performance for layer house four also started with a delay in egg production. Also, production did not reach expectation due to the mortality of three birds during the study period. At the end of the study, house four reported a

total production of 3401 eggs, sold at R0.83 (average egg price) that would bring an estimated income of R 2822.83. With electricity representing the only expenditure the household had to cover in this economic analysis, the net income is R2622.83 (Table 13). A projection of the production to the end of the egg production cycle (at 70 weeks) gives a total of 13400.8 eggs. There were 3 mortalities at the end of the study. As the study funding ended, households had to use their own money and households' expenditure included feed, electricity and trays, representing R 7281.79 at the 70th week. If the average price of egg remains constant (at R 0.83), 13400.8 eggs will bring an income of R11222.66. The difference between this income and expenditure brings the households' net income to R3840.87. Given that this hen house brings together 4 households, the net income for an individual household at the 70th week is R 960.21, or a monthly net income of R112.97 per household. An additional R281.25 per household per production cycle would be generated from the sale of culled birds (three died).

4.4 Costs and other requirements for the establishment of poultry production in the Maphephetheni lowlands

Given that broiler production is both the most technically feasible and economically viable poultry enterprise in Maphephetheni lowlands, this section deals only with costs related to broiler production, to enable household to brood chicks from day one. Table 5.4.1 shows the cost for the establishment of a broiler house with 500 day old chicks placed, and kept up to six weeks. However, one broiler house would only allow producing households to sell chickens every two months, as it takes two weeks to prepare and rest the broiler house before placing new birds (Ross, 2002). Two broiler houses are needed for households to sell chickens every month of the year. However, it is important that households use one house as a pilot project, to increase knowledge of broiler production and marketing.

At current production costs and local prices, households could generate R15.29 per bird, particularly if production is scaled up to units of 500 birds. This is based on starting with day-old chicks (cheaper than those that are already brooded). Some investigation would be required as to the capacity of the households to brood the chicks, although the experience gained in raising the two batches of birds, should be sufficient.

Table 4.12 Actual and projected income from layer house 4 (n=48)

Description	Rands
Average egg price (R/tray)	15
Average egg price (R/egg)	0.83
Total prod to date	3401
Income	**2822.83**
Expenditure(electricity) (50x4 months)	200
Net income to date	**2622.83**
Expected Total production @ 70 weeks	13400.8
Expected Income @70 weeks	11122.664
Expenditure @ 70 weeks	
Trays	184.29
Feed	6660
Electricity (50X 8.75 months)	437.5
Total expenditure @ 70 weeks	**7281.79**
Net income/ @ 70 weeks	**3840.87**
Net income @ 70 weeks / 8 households	**960.21**
Average household Net income/month	**112.97**

4.5 Contribution of poultry production to improve Household Dietary Diversity

The Household Dietary Diversity Score, and percentage of households consuming different food groups, were established and compared, between both phases of the survey, using a paired t-test. A comparison of the consumption of chickens and eggs was also done, and it was observed that the consumption values for each household were exactly the same in the baseline and the endline studies, so it was not possible to compute a t-test for the paired samples.

The dietary diversity scores ranged from eight to 15 (out of 16). Households consumed very little fish (27.5 % of households consumed this); organ meat (25 %) and vitamin A rich fruits (30%). A paired t-test was used to compare the dietary diversity score before and after the trial, and the result showed that the proportion of households consuming foods from each food groups were identical (p-value = 1.000).

Table 4.13 Estimated cost for broiler production (n=500) in Maphephetheni lowlands

Description	Unit price/Rands	Quantity	Total price/Rands
CAPITAL INVESTMENT			
Building (per m square)	450	50	22500
Curtains (PVC MW) per m square	51.30	50	2562
Installation winch and winch bracket	120	50	6000
4L Water founts	21.25	15	318.75
10L Water founts	52.90	15	793.50
Chick trays	18.90	15	283.50
Pvc tube feeders	76.60	15	1149
Infra-red lamps	878.35	10	8783.50
Masonite (brooder guards)	50	6	3000
Protective clothing	100	2	2000
Refrigerator	2500	1	2500
Footbath basin	40	1	40
TOTAL CAPITAL INVESTMENT			**49630.25**
RUNNING COSTS			
Day old Chicks	4.5	500	2250
Wood shavings	27	10	270
Disinfectant/detergent	75	2	150
Electricity	150	1	150
TOTAL RUNNING COSTS			**5320**
BROILER FEED			
Broiler starter crumbles	10	225.72	2257.20
Broiler grower pellets	10	180.12	1801.20
Broiler finisher pellets	10	201.21	2012.10
Broiler post finisher pellets	5	188.10	940.50
TOTAL BROILER FEED			**7011**
VACCINATION			
Newcastle @ day 1 (1000 doses)	1	36.76	36.76
Newcastle @ day 12 (1000 doses)	1	36.76	36.76
IBD/Gumboro @ day 14 (1000 doses)	1	34.00	34.00
IBD/Gumboro @ day 18 (1000 doses)	1	34.00	34.00
Newcastle @ day 21 (1000 doses)	1	36.76	36.76
TOTAL VACCINATION			**178.28**
ESTIMATIONS			
Transport costs per month per batch			500
GRAND TOTAL			**60289.53**
Income per production cycle (R40 x 500 birds)	40	500	20000
Operating expenses	24.71	500	12355.00
Profit per cycle	15.29	500	7645.00

Based on these findings, it can be concluded that poultry production did not improve household dietary diversity in Maphephetheni lowlands during the trial period. This is because income generated was put into a savings account and households borrowed and used money for various needs, but not necessarily for purchasing food.

Using a paired t-test, a comparison of the consumption of chickens and eggs was also done, and it was observed that the consumption values for each household were exactly the same in the baseline and the endline studies, so it was not possible to compute a t-test for the paired samples.

Table 4.14 paired *t*-tests for consumption frequency of chicken and eggs for the baseline and endline studies (n=40) in Maphephetheni lowlands, 2008.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	eatchicke1	1.8056[a]	36	1.19090	.19848
	eatchicken2	1.8056[a]	36	1.19090	.19848
Pair 2	eategg1	2.1429[a]	35	1.71743	.29030
	eategg2	2.1429[a]	35	1.71743	.29030

a. The correlation and t cannot be computed because the standard error of the difference is 0.

A chi-square test showed that there was an association between income, and consumption of tubers and vitamin A rich vegetables (p-value: 0.039). From the cross table it is evident that households with income of less than R950 per month ate more Vitamin A rich vegetables and tubers than households with a higher income (p-value: 0.039). All households headed by self-employed and disabled people, and the big majority of pensioners, ate white tubers and roots (p-value: 0.047); households headed by self-employed did not eat other fruits (p-value: 0.049); households with lower income tended to eat more eggs than households in higher income groups (p-value of 0.059); only 70 per cent of households whose head had high-school education level, ate legumes, nuts and seeds, while 100 per cent of all other households ate legumes, nuts and seeds (p-value 0.042) (Table 4.15)

Table 4.15 Cross table for the occupation groups and consumption of food groups (n=40) in Maphephetheni lowlands, 2008.

		Total Monthly Income (p-value: 0.039)				Total
		Less than R950	R950 - R1700	R1700 - R3000	R3000 - R7540	less than R950
Did any member of your household eat Vitamin A rich vegetables and tubers over the past 7 days?	yes	15	4	2	6	27
	no	1	4	2	6	13
Total		16	8	4	12	40
		Occupation (p-value: 0.047)				
		wage	self-employed	housekeeper	pensioner	disabled	Unemployed
Did any member of your household eat white tubers and roots over the past 7 days?	yes	5	2	1	12	4	3
	no	3	0	5	3	0	2
Total		8	2	6	15	4	5
		Occupation (p-value: 0.049)				
		wage	self-employed	housekeeper	pensioner	disabled	Unemployed
Did any member of your household eat other fruits over the past 7 days?	yes	6	0	5	8	4	5
	no	2	2	1	7	0	0
Total		8	2	6	15	4	5
		Total Monthly Income (p-value of 0.059)				
		less than R950		R950 - R1700	R1700 - R3000	R3000 - R7540
Did any member of your household eat eggs over the past 7 days?	yes	13		6	2	4
	no	3		2	2	8
Total		16		8	4	12
		Highest level of education (p-value 0.042)				Total
		uneducated	Primary	high school	matric	Uneducated
Did any member of your household eat legumes, nuts and seeds over the past 7 days?	yes	13	10	7	2	32
	no	0	0	3	0	3
Total		13	10	10	2	35

The *t*-test showed that female-headed households tended to eat more eggs (p value: 0.504) and chicken (p value: 0.060) than male-headed households. This could be due to the fact that women prepared or purchased cooked eggs for children, as eggs are also sold in local schools. The *t*-test also showed that households with higher education levels ate more eggs (p value: 0.000) and chicken (p value: 0.010). This could be due to health education that promotes poultry as a healthier source of protein than red meat, or simply a factor of availability.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This study assessed the feasibility of the establishment of poultry production to contribute to household food security in the Maphephetheni lowlands. This chapter presents the conclusions and recommendations drawn from the findings from investigations of the following four sub-problems:

1 Do the sampled households have poultry-production skills?
2 Is there a market for poultry products in and around the the Maphephetheni Lowlands?
3 What are the socio-economic benefits that poultry production can generate in the Maphephetheni lowlands?
4 What are the costs and other requirements for the establishment of poultry production in the Maphephetheni lowlands?
5 Can poultry production contribute to increase dietary diversity and poultry consumption in the Maphephetheni lowlands?

Households did not have the necessary knowledge of poultry production at the start of the project, but acquired the necessary skills through a training session. As they engaged in production, they marketed poultry and eggs and managed their money. A ready market existed for poultry products in the Maphephetheni lowlands with demonstrated high demand, from both local consumers and traders. Egg production profit could be maximised by sorting and selling produce according to the South Africa size standards, but local prices are not determined by egg size as is the case in commercial markets. Both egg and broiler production are technically feasible in the Maphephetheni lowlands, but broiler production is more viable and more desired by households than egg production.

Households considered poultry production as a possible income-generating activity and a tool to reduce poverty and hunger in the Maphephetheni lowlands. Households in the Maphephetheni lowlands did not use poultry production as a source of food as did other households documented in the literature reviewed section. While the average egg production income was R122.65 per

month per household (6.02% more than household income) during the trial period, broiler production increased household income by over 11 per cent. The fact that households did not weigh birds created higher net income, as the birds were actually under the equivalent commercial weight per bird. Thethe weight per bird should have been at least 2.66kg to sell at R40/bird, although the standards used for comparison are applicable to commercial poultry production under optimum conditions. Community level production would likely be lower than commercial standards.

However, a number of constraints prevented households reaching standard production with both layer and broiler standards. These included: birds placed in inadequate housing; female participants having to ask permission from their husbands to use houses for poultry production; lack of experience in poultry production and limited production and marketing knowledge.

Commercial stocks of point-of-lay pullets and three-week vaccinated broilers could be used for poultry production in Maphephetheni lowlands, but broilers were more profitable than point-of-lay pullets. Therefore, households were keen to continue raising broilers for sale to the community.

Additional income boosted low household income, but did not improve dietary diversity (as would be expected), but the study did not investigate the quality or quantity of food consumed and so it is not known if overall dietary intake improved or increased. However, the income generated from the trial was very low per household. Economies of scale would likely improve profitability and have a greater influence on household consumption.

5.1 Recommendations

The results of this study suggest that broiler production is suitable for households in the Maphephetheni lowlands. This raises the need for technical and financial support to maximise the benefits of broiler production, to increase household income. Therefore, it is recommended that ESKOM champions a partnership with Government departments and households to start more and larger broiler production pilots, each with 500 chicks. While ESKOM could provide

financial support in this partnership, government support could include veterinary assistance, training, extension support, cages and transportation for feed. Such a partnership has already been working in this study as the Department of Agriculture facilitated the transporting of feed. Models for distribution of inputs through small-scale vendors should be explored by government.

The South African Poultry Association in Gauteng is approaching government to accept tenders for poultry from small-scale farmers. While this may be more expensive for government, subsidising or supporting small-scale farmers in a guaranteed market where it is difficult to compete with commercial farmers who have large economies of scale will help small producers enter and grow in a highly competitive market. While there is market demand for broilers in and around the Maphephetheni lowlands, contracts to supply hospitals, prisons and schools would help reduce risk and smoothen income through a guarenteed market. The sustainability of a replicated or expanded programme can be ensured by asking households to contribute towards broiler production start-up costs and attend training in all elements required for a poultry enterprise, including financial management and marketing.

5.2 Recommendations for further research

The study explored the potential for broilers and layers among sampled households in the Maphaphateni lowlands only. This study can be replicated in the Uplands and other communities. A further study, with houses of 500 birds, is necessary to see how the households are able to scale up the production and mannage sequential batches of birds. In addition, this study investigated the feasability of commercial layers and broilers and did not explore the feasability of farming traditional chickens. Further study could asses households' knowledge, attitude, practice towards challenges faced in rearing indigenous chickens. This would determine whether, and to what extent, traditional chicken production can improve household food security.

5.3 Recommendations for improvement of the study

This study has investigated Household Dietary Diversity based on whether food was consumed during the survey period. It would have been better had the Household Dietary Diversity

investigation included the quality and quantity of food consumed to estimate the overall improvement (or lack of) dietary intake. It would also have been better had this study investigated the primary source of food procurement in the Maphephetheni lowlands (whether it is own production, purchased, gift, food aid or other) to make specific recommendations for food security. Furthermore, water (both drinking and cooking) should be included in this study to measure the quality and quantity consumed by each household. Finally, given that Maphephetheni lowlands is rural (or an agriculture based-community) this study could have investigated the seasonality of food security in the community to establish a more informed baseline against which to compare Household Dietary Diversity Score.

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APPENDIX A: SURVEY QUESTIONNAIRE

The information captured in this questionnaire is strictly confidential and will be used for research purposes by staff and students at the University of KwaZulu-Natal to estimate the potential market for small-scale poultry products in and around Maphephethheni. Respondents include people selling poultry product any time, should they so wish.

Interviewer: _____

Date: _____

UNIVERSITY OF
KWAZULU-NATAL

Respondent's name:

For information call: Prof Sheryl Hendriks, ACFS, University of KwaZulu-Natal. Tel 033 2606075 or Moleka Mosisi 0825683270

Please indicate the names of household members. **(Use an extra form if more than 10 household members)**	**Write the names of all household members**									
	1…… **HEAD**	**2…..**	**3…..**	**4…..**	**5…..**	**6…..**	**7…..**	**8…..**	**9…..**	**10…..**
1. Is …… Male or female	☐ M ☐ F	☐ M ☐ F	☐ M ☐ F	☐ M ☐ F	☐ M ☐ F	☐ M ☐ F	☐ M ☐ F	☐ M ☐ F	☐ M ☐ F	☐ M ☐ F
2. Age in years	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
3. Highest level of **completed** schooling or educational training (years or grade) more than matric = 13 years	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
4. Occupation 1 = WAGE EMPLOYED 2 = FARMER 3 = SELF-EMPLOYED (E.G. TAXIS OPERATOR, SHOP KEEPER) 4 = HOUSEKEEPER 5 = PENSIONER 6 = DISABLED 7 = UNEMPLOYED BUT SEEKING WORK 8 = SCHOLAR 9 = INFANT OR CHILD (0 – 6 YEARS) 10 = VAGRANT	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐10	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐10	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐10	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐10	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐10	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐10	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐10	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐10	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐10	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐10
5. Wage or salary income (Rands per month)	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
6. Income from social grants ie pension, child grant, disability (Rands per month)	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
7. Income remitted by migrants and commuters (Rands per month)	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

	Person (respondent) number									
	1…… HEAD	**2…..**	**3…..**	**4…..**	**5…..**	**6…..**	**7…..**	**8…..**	**9…..**	**10…..**
8. During the past year did any household member earn income through any of the enterprises listed below? If yes, report the income from each activity.	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
8.1 Hiring out accommodation										
8.2 Hiring out contractor service or equipment										
8.3 Milling grain										
8.4 Baking, brewing or selling meals										
8.5 Building or repairing houses										
8.6 Block making, stone or metalwork										
8.7 Hawking										
8.8 Shop-keeping										
8.9 Selling of firewood										
8.10 Making furniture or handicraft										
8.11 Home/community gardern										
8.12 Selling livestock										
8.13 Selling of traditional medicine										
8.14 Other (specify)										

9. Housing ownership

9.1 Number of house in the homestead						
9.2 Type of house	**House 1**		**House2**		**House3**	
9.2.1 Rondaval, mud, bricks, thatch						
9.2.3 Rondaval:mud, tin roof						
9.2.4 Rondaval brick, thatch/tin roof						
9.2.5 Block house, tin roof	No of rooms		No of rooms		No of rooms	
9.2.6 Brick hous:tile roof	No of rooms		No of rooms		No of rooms	

Do you have	**Yes, No**			
9.3 Water tap at the house		In the steet	further distance	
9.4 Toilet		VIP	Pit	Other
9.5 Electricity		Eskom		
9.6 Radio		Solar Power	since when	
9.7 TV				
9.8 Telephone		Telkom	Cellular	Pay as you go Contract

10. Dietary diversity

Question number	Food group	Examples	YES=1 NO=0
1	CEREALS	bread, noodles, biscuits, cookies or any other foods made from millet, sorghum, maize, rice, wheat + *insert local foods e.g. ugali, nshima, porridge or pastes or other locally available grains*	
2	VITAMIN A RICH VEGETABLES AND TUBERS	pumpkin, carrots, squash, or sweet potatoes that are orange inside + *other locally available vitamin-A rich vegetables (e.g. sweet pepper)*	
3	WHITE TUBERS AND ROOTS	white potatoes, white yams, cassava, or foods made from roots	
4	DARK GREEN LEAFY VEGETABLES	dark green/leafy vegetables, including wild ones + *locally available vitamin-A rich leaves such as cassava leaves etc.*	
5	OTHER VEGETABLES	other vegetables (e.g. tomato, onion, eggplant) , including wild vegetables	
6	VITAMIN A RICH FRUITS	ripe mangoes, cantaloupe, dried apricots, dried peaches + *other locally available vitamin A-rich fruits*	
7	OTHER FRUITS	other fruits, including wild fruits	
8	ORGAN MEAT (IRON-RICH)	liver, kidney, heart or other organ meats or blood-based foods	
9	FLESH MEATS	beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds	
10	EGGS	fresh or dried fish or shellfish	
11	FISH		
12	LEGUMES NUTS AND SEEDS	beans, peas, lentils, nuts, seeds or foods made from these	
13	MILK AND MILK PRODUCTS	milk, cheese, yogurt or other milk products	
14	OILS AND FATS	oil, fats or butter added to food or used for cooking	
15	SWEETS	sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies	
16	SPICES, CONDIMENTS, BEVERAGES	spices(black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages OR *local examples*	

11. Poultry consumption and market

11.1 How many times did your household eat chickens over the last week?	
11.2 How many times did your household eat eggs over the last week?	
11.3 How many times in a week does your household prefer to eat chickens?	
11.4 How many times over a week does your household prefer to eat egg?	
11.5 What kind of chickens your household purchase (live, slaughtered, packaged?	
11.6 Where does your household purchase the chickens you are consuming?	

12. Ownership of livestock

Do you own any livestock?					
12.1 Type of livestock	Number and value (Rand)	Number sold last 12 months	Income from sales last 12 months	number of sick last 12 months	Number slaughtered last 12 months
12.1.1 Cows					
12.1.2 Cheep					
12.1.3 Goat					
12.1.4 Pig					
12.1.5 Ox plough					
12.1.6 Chicken					
12.2 Where did you get your chicken?					
12.3 Why do you sell your chicken?					
12.4 Where (distance from the house) do you sell them and how much?					
12.5 Why do you slaughter your chikens?					
12.6 How do you know if chickens are sick?					
12.7 What makes your chickens sick?					
12.8 What medications do you give to your sick chickens?					
12.9 Did your chickens die in the last 12 months? If yes, please indicate the cause					
12.10 Does the number of chicke and other animal increased every year?					

13. Open ended questions for focus group discussion

a. What are key problems that affect your supply of chicken and egg (be it own production and/or purchase?)

b. How can you overcome those problems?

c. What are the socio-economic benefits this project can generate in Maphephetheni?

d. Where do you intend to sell your poultry products (in and/or outside Maphephetheni)?

13.5 How do you intend to sustain this project after the research funding end?

THANK YOU FOR PARTICIPATING IN THIS SURVEY

APPENDIX B: SURVEY QUESTIONNAIRE (MARKET INVERSTIGATION)

The information captured in this questionnaire is strictly confidential and will be used for research purposes by staff and students at the University of KwaZulu-Natal to estimate the potential market for small-scale poultry products in and around Maphephethheni. Respondents include people selling poultry product any time, should they so wish.

Interviewer: _____

Date: _____

UNIVERSITY OF
KWAZULU-NATAL

Respondent's name:

For information call: Prof Sheryl Hendriks, ACFS, University of KwaZulu-Natal. Tel 033 2606075 or Moleka Mosisi 0825683270

1. Would you please describe your day to day activities in this market?

   _____
   _____
   _____

2. Do you raise or purchase chicken and/or eggs that you sell?

   _____
   _____
   _____

3. Where do you get your stock?

   _____
   _____

4. What are the costs involved in this business?

Cost	**Daily**	**Weekly**	**Monthly**
Stock			
Rent for stall			
rent for storage			
Transport			
Tax			
Tools/equipment			
Other (specify)			

5. Would you please indicate the prices of the following poultry products you are selling?

Product	Unit price	Total price
Live chicken		
Slaughtered chicken		
eggs		
Other (specify)		

6. How many product (or for how much) do you sell during the following period?

Product	Pay day	Ordinary day	week
Live chicken			
Slaughtered chicken			
eggs			
Other (specify)			

7. What are the requirement should one meet to be selling at this market?

8. Who are your customers and where are they coming from?

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9. Do you only sell here?