Evaluation of the Application of a Thermostable Newcastle Disease Vaccine by Community Volunteers in the North West Province

by

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SUMMARY

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

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

After a focus group discussion to select methods of vaccination only two of the three methods were chosen. A training session was arranged for training volunteer vaccinators in the method of vaccination i.e. water and in-feed administration

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

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

An investigation was done as to find the reasons for the sudden drop-off in community participation between vaccination campaigns as well as to obtain further information about vaccine handling and preparation by the community vaccinators.

It was found that a concurrent disease outbreak causing the deaths of chickens and the attitude of the owners probably contributed to the demotivation of volunteers used as community vaccinators

Another unexpected finding was the rate at which chicken flock numbers appeared to alter between vaccination campaigns. The reason for this is yet to be established but may indicate that chickens are moved between homesteads belonging to a single family, depending on what forage is available, or other unidentified disease problems. It was concluded that probably volunteers are not ideal for vaccination of community poultry. They are easily demotivated; do not keep good records and left the project when offered permanent employment.

DECLARATION

Apart from the assistance received,

which has been reported in the Acknowledgements,

and in appropriate places in the text,

this Dissertation represents the original work of the author.

The material in this Dissertation

has not been presented

for any other degree at any other University.

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INTRODUCTION

1.1 Motivation

Rural chickens are susceptible to Newcastle disease (ND), which causes devastating losses in poultry industries throughout the world. In South Africa commercial farmers control ND by successive vaccination with appropriate vaccines, while with rural chicken households there is a lack of knowledge on vaccination techniques (Bisschop, Mogoje & Thekisoe 2003).

This results in frequent ND outbreaks in rural chickens with high mortalities. There is a need for skills transfer to village poultry owners on vaccination in South Africa as backyard chickens are important for the socio-economic life of rural communities. Poultry raising is an enterprise available to all farming families, even the poorest. It is an important source of protein to the poorest of the poor (Moreki & Masupu, 2001).

Previous research with rural small-scale poultry farmers and owners of backyard chickens has shown that vaccination with ND Inkukhu® vaccine could be successfully done by mixing the vaccine with food or water or applying it as a droplet to each eye (Bisschop *et al* 2003; Thekisoe, Mbati & Bisschop, 2004). All three of these methods are simple enough for a rural small-scale farmer or owner of poultry to implement; however, they are not doing so. It was therefore decided to investigate, using participatory methods, whether community volunteers could be trained to vaccinate poultry.

1.2 Background

Northwest Province (NWP) in South Africa is predominantly rural with 66% of the population living in rural areas. People living in rural areas or villages are usually very poor, but most own at least 5-10 chickens. They get meat and eggs as sources of protein from these chickens.

1.2.1 Study area and population

Disaneng village in the NWP falls under Ratlou municipality; ward three. Please refer to Appendix F (a map of the study area). According to statistical data the total population of this area is 7 861, with a total of 3 604 males and 4 257 females. Most people living there are Setswana speaking with smaller proportions that speak Afrikaans, English, Sesotho, Sepedi, siSwati, isIndebele, isiXhosa and isiZulu. It is reported that 20% of the people over 20 years old have no schooling, 31% have attended primary school, 8% have completed primary school, whilst only 10% have done Grade 12. The percentage of those who acquired higher education is less than 1 % (Stats SA, 2001).

The chief of Disaneng village is Mr. Mogakolodi Masibi. He has headmen for each section to help him run the affairs of the village. The tribal authority is consulted through these headmen or the tribal secretaries Mr. Nthwane and Ms. Mokgothu.

1.3 Problem statement

Free-range chickens are vulnerable to epidemics of ND. Currently the vaccination of free-range poultry is inadequate and a method must be found to motivate owners to vaccinate their own poultry, as the state veterinary services have not got the manpower or funds to do routine vaccination and will only be able to respond in an outbreak situation. Poultry are an important contributor to household food security; therefore loss of this resource would result in the loss of an important, inexpensive source of protein.

1.4 Research hypothesis

It is hypothesized that the training of volunteer vaccinators will enable the effective vaccination of rural chickens.

1.5 Research aim

The aim of this project is to find out if community vaccinators, when given free vaccine, will vaccinate poultry in their own community and which method viz. eye-drop, water or feed is preferred. The efficacy of vaccination will be assessed by serology whilst the response of the community will be assessed using structured interviews.

1.6 Research objectives

- The main objective of this project is to use participatory research to develop a method of extension that will lead to volunteers selected by small-scale poultry owners in a community vaccinating their own chickens every three months, if given free vaccines.
- The second objective is to evaluate whether the vaccination is effective, by doing serological tests on poultry that have been vaccinated.

1.7 Benefits arising

- The control of ND in village chickens will allow greater production of chicken meat and eggs and will provide an incentive for controlling other diseases and for improving husbandry.
- The information gathered in this study will be available to inform future efforts to vaccinate free-ranging chickens in South African rural communities.
- Vaccination of rural chickens will decrease the spread of ND to commercial poultry

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In South Africa little work has been done on backyard poultry. People in rural areas, that own backyard chickens, have inadequate access to veterinary or extension services. Vaccination campaigns against ND are conducted in these areas by the state veterinary services only when disease outbreaks occur. The owners of the poultry do not appear to have the motivation or skills to vaccinate their own poultry. The state does not have the finances to vaccinate all these fowls routinely (Tsibane, 2001). This large pool of unvaccinated backyard poultry also poses a constant threat to the commercial poultry sector.

2.2 History and etiology of Newcastle disease

Newcastle disease ND is one of the major constraints to rural chicken development. The disease may cause mortality approaching 90% and sometimes decimates whole flocks during outbreaks in susceptible chickens (Ideris, Ibrahim, Spradbrow & Hung Seng, 1997; Alders, 2000; Jordan, Pattison, Alexander & Faragher, 2001; Bagnol, 2001). The disease got its name from the place in which a series of outbreak first occurred i.e. Newcastle-on-Tyne in England .

ND has been variously referred to as fowl pest, pseudo-fowl pest, pseudo-vogelpest, Atypiche Geflugelpest, Ranikhet disease and avian pneumoencephalitis and there has been much confusion in nomenclature between (ND) and fowl plague (Allan & Gough, 1974). The name "Newcastle disease" has worldwide acceptance.

Originally in the years 1926 to 1940 almost all cases of severe disease were found in, or near to, seaports. For 30 years it remained the only known avian paramyxovirus. Worldwide spread began with the aid of the refrigerated transport of meat that was then coming into common use. According to Jordan *et al* (2001), the history of ND is marked by three panzootics in domestic birds. The first panzootic, which occurred in the mid-1920s, spread slowly from the Far East throughout the world, faster within some

countries. It occurred in domestic fowls. The second one also appeared in domestic fowls in the Middle East in the late 1960's and spread much faster than the first, reaching all continents. By 1973 most countries were affected. The third pandemic emerged in the Middle East between the late 1970's and the mid-1980. It spread throughout the world in racing, show, meat and feral pigeons. In some countries it spread to other birds and poultry.

Newcastle disease is caused by a virus of the avian paramyxovirus type 1 (APMV-1) serogroup. It has been placed in the genus Rubularvirus together with eight other APMV serotypes. It belongs to the subfamily paramyxovirinae, family paramyxoviridae and order mononegavirales. It has been shown to infect a very large range of avian species and isolates vary enormously in their virulence for chickens, although usually clustered around the two extremes of the tests employed to estimate this. Viruses of low virulence for chickens appear to be enzootic in feral birds, especially waterfowl (Jordan *et al*, 2001).

ND virus varies widely in the type and severity of the disease it produces. This has caused problems in recognizing the disease. ND is complicated in that different isolates and strains of the virus may induce enormous variation of diseases, even in a single host like the domestic fowl.

Strains of NDV have been grouped into five pathotypes on the basis of the clinical signs seen in infected chickens (OIE 2000):

1. Viscerotropic velogenic - A highly pathogenic form in which haemorrhagic intestinal lesions are frequently seen.
2. Neurotropic velogenic - A form that presents with high mortality, usually following respiratory and nervous signs.
3. Mesogenic - A form that present with respiratory signs, occasional nervous signs, but lower mortality.
4. Lentogenic - A form that presents with mild or sub-clinical respiratory infection.
5. Asymptomatic enteric – A form that usually consists of a sub-clinical enteric infection.

2.2.1 Public health significance of ND

It has been shown that both vaccinal and virulent (for poultry) strains of Newcastle disease virus may infect and cause clinical signs in humans. The best substantiated clinical signs in human infection have been eye infections usually consisting of unilateral or bilateral reddening, excessive lachrymation, oedema of the eyelids, conjunctivitis and subconjunctival hemorrhage. Infections are usually transient and the cornea is not affected. Sometimes more generalized infection may occur resulting in chills, headaches, and fever with or without conjunctivitis (Saif, Barnes, Glisson, Fadly, Mcdougald, Swayne, 2003).

2.3 Signs of ND in chickens

The incubation period of ND varies from two to 18 days according to the virulence, route of administration, dose of virus and the active or passive immune status of the fowl. The incubation period is usually between four and five days in natural infections. Unusual quietness is usually noticed in chickens about a day before clinical signs become evident. The chickens become dull and febrile and stand huddled with ruffled feathers (Jordan *et al*, 2001).

The natural routes of infection (nasal, oral and ocular) appear to emphasize the respiratory nature of the disease and intramuscular, intravenous and intracerebral routes appear to enhance the neurological signs (Saif *et al,* 2003).

With the highly virulent form of this disease, drooping of first one and then both wings occurs. Incoordination always follows and the affected fowls will lie on one side with slight twitching of the neck and head. The body temperature drops and lack of swallowing reflex results in strings of saliva coming from the beak. Greenish watery diarrhoea, which is almost always seen, indicates anorexia. In the less virulent form of the disease the main sign is respiratory distress. The disease is severe in young birds and there is a considerable degree of age resistance. In laying stock with some immunity, the only sign of infection may be a drop in egg production. In the case of hens, which lay brown eggs, this drop may be accompanied by a temporary lack of pigment in the eggshells and misshapen and shell-less eggs are common in all laying stock (Jordan *et al*, 2001; Saif *et al,*, 2003).

The nervous form of ND predominates in susceptible chicks, which lose control of the head and neck. The head is twisted slightly and then the twist increases progressively until the head rests on the ground with the beak facing forward and the chick moves backward (Jordan *et al*, 2001).

2.4 The social and economic impact of ND control

The global economic impact of ND is enormous. It surpasses any other poultry virus and it represents a greater impact on the world's economy than any other animal virus. The economic impact of ND should not only be measured in direct commercial losses, but in some countries, in the effect on human health and loss of potential socioeconomic gain from the availability of cheap edible protein (Bagnol, 2001).

ND is endemic in many developing countries and therefore represents an important limiting factor in the development of commercial poultry production and establishment of trade links. Many countries rely on village chickens to supply a significant portion of dietary protein in the form of eggs and meat, especially for women and children (Bagnol, 2001).

Poultry plays an important role in meeting economical and social obligations for many households especially for poor families. In addition to slaughtering for home consumption, chickens are sold to raise money for the purchase of food, medicine, clothes and payment of school fees and other things. Chicken is regarded as a special food during ceremonies, entertaining visitors and as a gift (Carrilho, 2001).

It is important to increase the capacity for disease prevention, in order to protect this important resource i.e. poultry-raising. Backyard chickens are not very productive, but every egg and every chicken that becomes available for consumption or sale is a benefit to the owner and produced at minimal cost (Spradbrow & Samuel, 1991; *I*deris *et al*, 1997; Carrilho, 2001).

There will also be possibilities for improving food security in rural communities through control of ND in village poultry. Chickens are the most accessible livestock species for people of lesser means, thus constituting a source of inexpensive protein. Their reproductive cycle is short, this may be the reason why their numbers increase quickly even after a natural disaster like ND (Alders, 2001; Carrilho, 2001).

Control of ND is dependant upon vaccination. The principle of vaccination against viral diseases is to elicit an immunological response against the virus in such a way as not to cause the disease itself (Bell, 2001). The vaccine protects the bird from the more serious consequences of the disease, but virus replication and shedding may still occur at reduced levels. It should in no way be regarded as an alternative to good management practice, biosecurity or good hygiene in rearing domestic poultry (Spradbrow & Samuel, 1991; Jordan *et al*, 2001;Chen & Wang, 2001).

Backyard chickens are not vaccinated because the use of conventional vaccines for control of ND poses a difficult logistic problem (Nasser, Lohr, Mebratu, Zessin, Baumann, Ademe, 2001). These involve maintenance of the cold chain, running after unconfined chickens, using properly trained vaccinators and making it a point that chickens receive the required dose of vaccines at the right times. Conventional thermolabile vaccines have not been appropriate for village poultry because of their strict requirement for a cold chain (Spradbrow & Samuel, 1991;Bell, 2001).

The advent of thermostable vaccines has revived the possibility of controlling the disease in village chickens. According to Tsibane (2001), large vaccination campaigns have not been launched in South Africa due to financial constraints and priorities, as rural poultry are not perceived playing any important role in the economy of the country. The impact on low-income communities that are dependent on their poultry as a source of protein and food security is also seldom considered, as the poor have no voice in organized agriculture. However, village fowls pose a constant and serious threat to the well-established commercial poultry sector, in terms of disease spread, especially ND, as most of them are not vaccinated (Spradbrow, 1992).

2.5 ND Vaccines

There are two groups of ND vaccines available on the market, inactivated vaccines and live vaccines (Saif *et al,* 2003).

2.5.1 Inactivated ND vaccines

Growing a virulent virus in eggs, and then treating it with an inactivating agent produces inactivated vaccines. Either an aluminum hydroxide adjuvant or oil emulsion adjuvant is used to make the virus more immunogenic. The vaccine has to be individually injected into every chicken to be vaccinated since it is not capable of spreading (Saif *et al*, 2003; Bell, 2001).

Injection is either intramuscular or subcutaneous. Inactivated vaccines are less heat sensitive and therefore easier than live vaccines to store and to transport to rural villages. They are, however, more expensive to produce and to apply than live vaccines because of the training needed for their application. They give very good immunity without vaccinal reaction (Bell, 2001).

2.5.2 Live ND vaccines

Live vaccines are made from naturally occurring ND viruses that are not virulent enough to cause serious disease. They differ from inactivated vaccines in that they can replicate in the host. With live vaccines it is not necessary to vaccinate every chicken individually since the vaccinal virus can spread on its own from one to another. It is disadvantageous because an infection with a live virus is involved, and the chickens can react to the vaccination in manifesting some signs of the disease. The severity of this reaction depends on the particular vaccinal strain used and the presence of concurrent infection with other pathogens (Alders, 2000).

The most common method for vaccine application used worldwide is via the drinking water or eye-dropper (Bell, 2001). Large numbers of chickens can also be vaccinated in a short time by sprays and aerosol (Jordan *et al*, 2001). Live vaccines rapidly induce protection as early as three days post vaccination, depending on the route of vaccination. The immunogenicity of live ND vaccines is usually considered to be comparable to the degree of clinical reaction induced following administration. (Morgan, Gelb, Pope, Sondermeijer, 1993). In general, live vaccines are easy to apply and give moderately good immunity (Spradbrow & Samuel, 1991).

Live ND vaccines are divided into two groups i.e. lentogenic and mesogenic

2.5.2.1 Mesogenic vaccines

They have previously been used for vaccination in the village situation but they may produce severe vaccinal reactions. This type of vaccine should not should not be used anywhere where any part of the fowl population lacks immune protection against the virus, on account of the vaccinal reaction (Alexander, Bell, & Alders 2004). They are normally used in commercial chickens after a first vaccination with a lentogenic vaccine. An example of a mesogenic vaccine strain is Komarov, which is used in some countries in Africa. (Bell, 2001; Alexander *et al*, 2004). Mesogenic strains are of moderate virulence;

causing mortalities of up to 50% and seriously reducing egg production (Spradbrow, 1992)

The mesogenic vaccines fall within the current OIE definition of viruses responsible for ND (Saif *et al*, 2003). Mesogenic vaccines are used in countries where ND is endemic and are suitable for secondary vaccination of chickens because of their virulence. The application of mesogenic vaccines usually requires intramuscular injection (Jordan *et al*, 2001). The immune response to the live vaccine increases as the pathogenicity of the vaccine increases (Saif *et al,* 2003; Morgan *et al.*, 1993).

2.5.2.2 Lentogenic ND vaccines

The Lentogenic type also varies in virulence (Bell, 2001). The immune response increases as the pathogenicity of the live vaccine increases. Individual chicken treatment such as intranasal instillation, eye-drop, and beak-dipping are often used for lentogenic vaccine. (Saif *et al,* 2003) Vaccines using the lentogenic strains should be kept at low temperature to maintain their efficacy. The need for the cold chain during distribution can be very difficult in village settings, particularly in areas of high ambient temperature. The best-known lentogenic vaccines are Hitchner B1 and La Sota (Bell, 2001).

La Sota produces moderate vaccinal reaction, particularly in young chickens, and according to Bell (2001) it is in theory unsuitable for vaccinating a multi-age population including young chicks such as the one in a village setting. It is because the virus spreads and it is not practical to isolate the adults from the chicks.

2.5.2.3 Thermostable ND vaccines

Modern asymptomatic strains have been cloned by taking a single infectious virus and growing a homogenous population from it, with the aim of selecting a vaccine virus that gives less vaccinal reaction and is heat resistant. Thermostable vaccines derived in this way from avirulent Australian strains of ND virus (strains V4 and I-2) have proved suitable for use under primitive village conditions because it is possible to transport them without having refrigeration available. (Spradbrow, 1992; Samuel & Spradbrow, 1989).

The I-2 strain of thermostable ND vaccine is particularly suitable for village use because of its' ready spread by contact. Large-scale trials indicated a considerable drop in the incidence of ND in villages that used the I-2 strain of vaccine. It is not possible to overdose with it and it is completely innocuous to both bird and handler. It also produces

no evidence of clinical respiratory signs, weight loss or mortality in young chickens or egg production drop after vaccination. It produces approximately 80% protection in the field in the face of an outbreak, when given every four months via the eye drop method (Spradbrow, 1992).

Registration trials using I-2and V4 have not been completed in South Africa, as a result neither product is available for use in South Africa.

2.5.2.4 ND Inkukhu® vaccine

Intervet (Pty) Ltd in South Africa has made a partially thermostable vaccine available. It is an ND Clone LZ.58 and is marketed by Intervet as Nobilis ND Inkukhu®[1] (Alexander *et a*l, 2004). It is a freeze-dried vaccine that is stable for up to seven days prior to dilution in temperatures not exceeding 30°C. It must be used within the seven-day period and not returned to refrigeration for further storage once it has been removed from refrigeration for an extended period (Alders, 2002; Intervet, 2000).

The vaccine can be administered via eye-drop, through drinking water or in-feed. The same dose is given to birds of all ages, from day old to adults. For eye-drop administration, the vaccine should be administered once, with revaccination every three to four months. Via water and in-feed medication, the vaccine should initially be given on two occasions, two to three weeks apart, with revaccination occurring at least every three months (Alders, 2002; Intervet, 2000).

2.6 Serological tests for ND

There are various laboratory tests to detect and quantify antibodies in vaccinated chickens. The Haemagglutination Inhibition test (HI) and Enzyme Linked Immunosorbent Assay (ELISA) are the most commonly used tests for antibodies against ND virus.

2.6.1 The Haemagglutination Inhibition (HI) test

The HI test is a convenient, common and simple assay that requires cheap reagents and is read by eye (Magalo, 2002). It has been used as an international standard method for detecting antibodies against Newcastle disease. Various versions of HI tests have been described. The most commonly used with ND virus is the micro-test described by Allan

[1] Intervet (Pty) Ltd., South Africa

and Gough (1974). HI titres indicate that a series of immune phenomena have been initiated in an infected or vaccinated chicken. The antibody that is measured is not the total immune response. Challenge with virulent field virus results in higher titres whilst titres as a results of vaccination are moderate.

2.6.2 ELISA (Enzyme Linked Immunosorbent Assay)

This test is used to monitor the response to vaccination of commercial chickens. The equipment (reader, washer and computer) required is expensive but very sensitive and requires only small amounts of reagents.

ELISA kits for ND virus antibody detection are prepared and sold commercially. Detailed instructions are supplied with the kit. They are usually quite expensive. They are a rapid method to test a large number of samples. Their results correspond directly with survival rates of birds challenged with Newcastle disease virus; it is, however, difficult to correlate the results obtained using different ELISA kits (Tabidi, Makkawi, Mahasin & Ali, 2004).

Interpretation needs experience and one has to consider the specific test used, number of samples, vaccination program and type of birds. It has proved to be accurate, sensitive and rapid but less economical than HI tests when used for detection of antibody titres against ND virus vaccine (Tabidi *et al*, 2004; Charan, Rai & Mahajan 1981). There are various companies selling the ELISA kits, in South Africa the Idexx kit ® is sold by Dehteq[2].

However the cost of the ELISA test was beyond the budget of this study and it was felt that HI was sufficiently sensitive.

2.7 Participatory Rural Appraisal (PRA)

Rapid Rural Appraisal was first formulated by Chambers in 1980. It is set of informal techniques used by a multidisciplinary team out in the field to rapidly acquire new information with “appropriate imprecision”, or in rural areas to collect and analyze data. According to the World Bank, group participatory rural appraisal evolved from rapid rural appraisal. The difference is that PRA emphasizes a process, which empowers local

[2] Flock Chek ® Newcastle Disease Virus Antibody Test. URL: www.idexx.com

people, whereas RRA is mainly seen as a means for outsiders to gather information. PRA is a label given to a growing family of participatory approaches and methods that emphasize local knowledge and enable local people to make their own appraisal analysis and actions among stakeholders (Chambers, 1992).

PRA was developed in response to a perceived problem of outsiders missing data or miscommunication with local people during research projects. In PRA data collection or research is done through shared learning between local people and outsiders that benefits both parties. The approach can be applied at every stage of the project cycle (Thrusfield, 1995).
The core principles of PRA are:

- It is participatory in its approach and uses and records indigenous practices.
- It focuses on opportunities as well as problems
- It is rapid

Participatory approaches have been developed from PRA methodology, where in depth research, rather than just situational appraisal, is desired. In South Africa, participatory approaches have been successfully used in veterinary science research by several authors (McCrindle, Tice, Mogajane, Stewart, Mosupi, 1994; Sebei, Mccrindle, Webb 2004; Mokantla, Mccrindle, Sebei, Owen 2004). Some of the useful techniques, borrowed form research in social science, include structured interviews, informal interviews and focus group analyses.

2.7.1 Structured interviews and informal interviews

These basically consist of developing questionnaires and then interviewing people face to face, in their own language. The main advantage is that the response is far better than that obtained from a written questionnaire. Structured interviews are built around a previously prepared interview schedule. Questions are asked as they appear in the schedule and the answers are recorded. Explanations are expected wherever necessary to clarify the question. The interviewer may also do some probing and ask the respondent to explain the answer, if it is found to be vague (Thrusfield, 1995,Cameron 2000).

Informal interviews consist of listening to individuals and recording their responses. Putting questions to a few individuals instead of carrying out a large-scale questionnaire based survey is useful as it often gives leads to problems or findings not addressed when structuring the original questionnaire. The interview can be done very informally e.g. as

conversation with people met in the field, co-operative store or block office. In these settings, one question leads to the next based on the responses given to the previous one. Answers and observations are then recorded in a logbook or notebook.

2.7.2 Focus groups

The focus group is a method used by the United State Department of Agriculture, among others, for making sure that decision-making and planning are participatory, or to get expert opinion for risk management (McCrindle, 2004). This is an in-depth interview carried out with a group of people rather than with an individual. This could be as large as a community meeting, or as small as a focus group representing a particular background and interest, or a natural group such as talking with women at the well. Usually, however it is fairly structured and the ideal group size is between five and 10 people with similar interests and experience.

Information from one individual can be crosschecked with others and more than one opinion is gathered. Members are prone to be open and what they say may be in the prevailing socio-cultural context. Group interaction enriches the quality and quantity of information obtained.

Focus groups are quite good at disclosing the range and nature of problems, as well as eliciting preliminary ideas about solutions. The disadvantage of the focus group discussion is that when multiple opinions arise, it can be difficult for the facilitator to determine which ones are right. This can be limited by using several focus groups on the same day with identical questions (two core questions are ideal), then doing a report-back to the plenary with discussion and consensus (McCrindle, 2004).

As a facilitator of a focus group discussion one should

- Identify the characteristics of the target group so as to communicate at their level
- Avoid appearing superior or knowing the answers
- Not lead the group in any way or express their views
- See to it that one or two people do not dominate the group and that all get the opportunity to participate
- Ensure that all important matters are covered, and that the discussion does not drift away from the central issue

- Encourage the participants to contribute to ideas, bring out constraints and also suggest possible solutions

The end of a focused group discussion should be an educational process and a learning experience for the participants and the researcher. The members should feel liberated and empowered after the event.

2.8 Extension methods

Agricultural extension methods operate in all developing areas of Southern Africa. It is a tool in government programmes and projects to bring about changes in agricultural production and raise rural living standards. It is basically defined as a system of non-formal education for adults in rural areas (Bembridge, 1991).

2.8.1 The SMCRE extension model of communication.

SMCRE stands for Sender, Message, Channel, Receiver and Effect.

- **Sender**

This is in most cases the extension officer or a particular organization.

- **Message**

This should be well designed, more profitable and productive and as reliable as traditional practices. It must also be relevant, simple, defined, structured and repeated.

- **Channel**

The choice of the channel depends on the total communication situation. The channel could be radio, TV, news media, farm visits, farmers' day or pamphlets (Sekokotla, 2004)

- **Receiver**

These are the target audience. It is important that their values, norms and standards are known

- **Effect**

It is always important to measure the effect of the message i.e. find if the desired effect have been reached (Bembridge, 1991; Sekokotla, 2004).

2.8.2 FSR-E (Farming System Research Extension)

FSR-E is a participatory method based on the holistic, systems approach. All factors are considered, not just the problem itself in isolation. These factors, or variables, are then assessed in relation to how they interact on each other (Sekokotla, 2004). Out of the research findings, an extension method is developed and tested in the field, and then modified and retested if found lacking (See Fig 1).

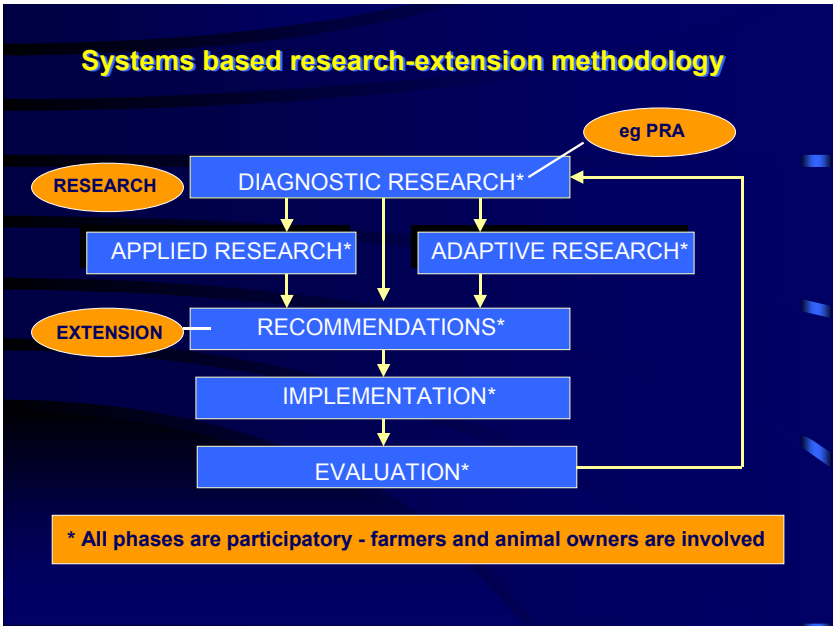


Figure 1.1: Systems based research –extension, after McCrindle (2004)

In this research study, the farming system being documented is small scale or back yard poultry production.

The variables that have an impact on any system can be intrinsic (inside) or extrinsic (outside) that system. In the case of this research into the feasibility of ND vaccination at village level, the variables intrinsic to the system would probably include, among others:

- The poultry – their characteristics, breed, nutritional level and what they are used for;
- The poultry owners - their level of education and interest in the health of their birds as well as their ability and skills in regard to poultry management;
- The environment in which the birds are kept – housing, pens or just outside;

- The characteristics of the people within the village who would like to assist with poultry vaccination – their time and other resources such as transport as well as their skills in handling and vaccinating poultry and
- Availability and affordability of the vaccine.

Some of the factors extrinsic or outside of this system would probably include:

- Infrastructure and communication within the community – hierarchy of the elected officials and chiefs, the roads and transport, the level of communication by telephone, radio etc.;
- The commitment of the state veterinary services to supplying the vaccine to the farmers or of outside agencies supplying the vaccine;
- Availability and affordability of the vaccine in South Africa and
- Environmental aspects such as a severe drought, flood, excessive heat etc.

All these variables and others identified during the research will be considered in Chapters 4 and 5 in discussions and conclusions.

2.9 Sampling methods

When undertaking any survey, it is essential that data is obtained from people that are as representative as possible of the group being studied. Survey data will only be regarded as useful if it is considered that respondents are typical of the population as a whole. For this reason, an awareness of the principles of sampling is essential to the implementation of most methods of research, both qualitative and quantitative (Thrusfield, 1995). Sampling methods are classified as either probability (random) or non-probability (non-random) sampling. A probability sample is one in which each member of the population has an equal chance of being selected. Methods include random sampling, systematic sampling and stratified sampling.

In a non-probability sample, some animals or people have a greater chance than others of selection. This is usually called convenience sampling as the sample taken is one decided by the researcher because it is convenient or, often, because true random sampling may be too expensive. For instance, it may be convenient to sample areas close to where the researcher lives because the transport budget is too low.

The advantage of probability sampling is that sampling error can be calculated. Sampling error is the degree to which a sample might differ from the population and results are reported plus or minus the sampling error or standard deviation. In non-probability sampling the degree to which the sample differs from the population remain unknown. (Cameron *et al.,* 2000; Thrusfield, 1995).

2.10 Sampling frames

According to Thrusfield (1995), the sampling frame is the list of the population from which the sample is drawn or the actual set of units from which a sample has been drawn. It may consist of:

- Individuals
- Households
- Institutions

2.10.1 Size of samples

The objectives and circumstances of the investigation are taken into consideration when deciding on the sample size (Thrusfield, 1995). The sample size is influenced by:

- The purpose of the study;
- Population size;
- The risk of selecting a bad sample;
- The allowable sampling error and
- Budgetary constraints associated with the project.

CHAPTER 3

METHOD

3.1 Introduction

The model system used was based on participatory rural appraisal (Chambers, 1992) and farming systems research (Ntse'ekhe, 1991). The extension model used was based on the SMCRE approach as described by Bembrige (1991). The serological evaluation was based on the model described by Allan & Gough (1974) and Wilson, Perrota, Frey, Eckroade (1984). Structured interviews were used to obtain data for participatory rural appraisal. The questionnaires used for structured interviews are included as Appendices A to F.

The steps in the research process were:

3.1.1 Experimental design

The steps in the research process were:

- Community meeting and focus groups
- Selection and training of vaccinators
- Registration of households for vaccination
- Vaccination of chickens by community vaccinators
- Evaluation of immune status using serology
- Questionnaires administered to vaccinators
- Structured interviews with selected community members
- Structured interviews with selected poultry owners
- Semi- structured concluding ward meetings

These are discussed in more detail in the following sections.

3.2 Community meeting and focus groups.

After individual consultation and meeting with the key role players in the village of Disaneng – including the Tribal authority and extension officers as well as the headmen of most the sections - a community meeting was set up on the 12th and 13th of May, 2004. The secretary in the Tribal office was asked to book the Community Hall. A copy of the agenda for the community meeting was faxed to the secretary, who distributed the information verbally, to all the headmen of the different sections of the village. In turn, the headmen informed community members during community meetings and also sent messages to schools, shops and gatherings such as funerals.

Either the members and the headman or members alone represented six of the nine sections of the village. The people seemed to be very excited about vaccination because they thought that all poultry disease problems were going to be solved.

The community meeting consisted of:

- Feedback to the community on the results of a previous vaccination campaign against ND. The research technician did this by presenting the results of his research in which he had tested the efficacy of three methods of ND vaccination in the same village.
- Description of the three methods available for vaccination
- Focus group discussion on which vaccine application method to use in a particular ward

3.2.1 Decisions by focus groups

Once the focus groups had deliberated and reported back to the plenary, consensus was reached on the vaccine methods preferred. The results are shown in Table 3.1 below.

Among the three methods of vaccination presented only the eye-drop method was not chosen, because, according to the farmers, most of the chickens in the village are not housed and thus are difficult to catch. No one wanted to use the eye-drop method because it required running after each and every chicken and they are quite wild.

The farmers who preferred the water method said it was good because:

- The chickens are used to drinking straight after eating.
- The chickens might refuse to eat porridge because they are used to maize.
- The owner can withdraw water overnight so as to make the chickens very thirsty the following day and they will then consume the water containing vaccine.

Those who preferred the in-feed method said that:

- Since the chickens are in most cases hungry they will not ignore the porridge.
- In cases where maize was fed, they would withdraw maize overnight so that the chickens would be are hungry the following day.
- With this method they would be sure that each and every chicken will get vaccinated since all will get the vaccinated porridge.

Table 3.1 Method of vaccination chosen by each section of the village

Section	Chosen Method of vaccination
Thoteng*	Feed
Ditshetlhong	Feed
Setlhabaneng	Feed
Ntswaneng	Feed
Botshabelo*	Feed
Manawane	Water
Senobolo	Water
Methusele*	Water
Senthumole	Water

*section that was later consulted

From each group, one person was nominated who recorded and/or presented the agreed method of their choice. All the nominated presenters were men. The person/s responsible for the preparation of the vaccine were chosen from each group. These people needed to have a refrigerator that was continuously working and be able to read and write. It was also important that a vaccinator should be well motivated, as the work was voluntary and no payment would be given.

3.3 Selection and training of vaccinators

A short introduction to Newcastle Disease, together with the three methods of vaccination was presented using an overhead projector, so as to accommodate those who had missed the meeting on the previous day. Thereafter skills training in the vaccine application method chosen by each group was done. Three members (one female and two males or vice versa) of the group were given a chance to practice the method.

Fifteen people were chosen from the six sections represented at the community meeting as community vaccinators. Four additional women volunteered and also attended the initial training session. Therefore a total of 19 community members attended the initial training session; however, seven of them never actually performed any vaccination.

The names, gender, age and level of education of community vaccinators as well as the way in which they joined the vaccination team and whether or not they vaccinated chickens, are shown in Table 3.2 below.

Table 3.2: Demographics of community members trained as vaccinators

SECTION	NAME	GENDER	AGE	EDUCATION	HOW CHOSEN	VACC.
1.Thoteng	Magadi	F	39	11	Home trained	Yes
	Ntebogang	F	43	9	Home trained	Yes
	Mmemme	F	32	10	Home trained	Yes
	Seitisho	F	54	4	Home trained	Yes
	Mmadisontaga	F			Volunteer	No
	Mmamtshali	F			Volunteer	No
	Topoentle	F			Volunteer	No
2.Ditshetlhong	Segametsi	F	36	11	Meeting	Yes
	Ranku	M	32	4	Meeting	Yes
	Feke	M			Meeting	No
3.Setlhabaneng	Tshepang	F	24	9	Meeting	Yes
	Galaletsang	F	24	11	Peer trained	Yes
	Kedibone	F	49	3	Meeting	Yes
	Nomtsaku	F	50	1	Peer trained	Yes
	Ouma	F	47	3	Meeting	Yes
4.Ntswaneng	Goitseone	M	38	5	Meeting	Yes
	Jeremiah	M	37		Peer trained	Yes
	Benjamin	M			Meeting	No
	Stanley	M			Meeting	No
5.Botshabelo	Dimakatso	F	37	10	Home trained	Yes
	Maipelo	F	48	4	Peer trained	Yes
6.Manawane	Mothibedi	M	52	7	Meeting	Yes
	Thabang	F	33	12	Peer trained	Yes
	Right	M			Meeting	No
7.Senobolo	Mosadiwapula	F	64	0	Meeting	Yes
	Khumalo	M	54	5	Meeting	Yes
	Barileng	M			Meeting	No
8.Methusele	Buru	M	34		Home trained	Yes
	Lexman	M	30	12	Peer trained	Yes
	Mogwase	F	32		Peer trained	Yes
9.Senthumole	Itumeleng	M	35	12	Meeting	Yes
	Keabetswe	F	39	12	Volunteer	Yes
Average			**40.1**	**7.4**		

Vaccinators from the three sections (Methusele, Thoteng, Botshabelo) not represented at the community meeting were selected in different ways. Their headmen chose some; others heard about the campaign by word of mouth and elected to assist. The researcher trained these six individuals at home – shown in table 3.2 as “home trained”. In seven

cases, trained vaccinators were elected to train their own assistants – shown in table 3.2 as “peer trained”. Altogether 24 community members functioned as vaccinators during the project.

There were 32 vaccinators throughout the vaccination campaign,. Most of the information about the vaccinators were obtained from the 24 that filled the questionnaire and did the actual vaccination. All in all 8 male vaccinators and 16 female vaccinators participated in the actual vaccination of poultry. Nineteen of the vaccinators were females.

3.4 Registration of households for vaccination

Community vaccinators were given a form (Appendix A) in which they could register chicken owners. It required the name of the chicken owner, the house number, the gender of the farmer, level of education, total number of chickens owned, his/her experience with chickens in terms of years and comments in connection with the health status of their chickens. Every farmer was encouraged to participate, as this exercise was for his or her benefit.

The decision as to when the vaccinators would have finished registering the farmers, how they would meet with them and where they were going to meet for vaccination and registering was revised on the basis of participatory consultations done with the different vaccinators.

In the cases where there were more than two vaccinators, some were involved as scribes and one was chosen as the person who informed the community of the day of vaccination prior to the set date.

3.5 VACCINATION OF CHICKENS BY COMMUNITY VACCINATORS

3.5.1 Supply of Vaccine to Community Vaccinators

Vaccines were distributed to all the sections of the village. Depending on the size of a specific ward, vaccination was done over 2-3 days. For those who preferred the in-feed vaccination, in addition to vials of vaccine, skimmed milk powder and maize meal were provided. Prior to every subsequent vaccination, vaccines and all the other materials for vaccination were transported to the village. The researcher transported the vaccine by taxi from Onderstepoort to Disaneng village in a cooler box with icepacks. On arrival they

were stored in a refrigerator belonging to a community member, before being transported to the vaccinators.

3.5.2 Vaccine Application

Vaccination was commenced as soon as the people falling under a particular vaccinator had been informed that on such a day at a particular time the vaccine would be ready for collection. Vaccine preparation was performed at the vaccinator's or the headman's house or any central place chosen by the people concerned.

In order to ensure that every household that wanted to participate had a chance to do so, a second vaccine distribution was carried out three weeks after the first one.

The vaccinators recorded the actual number of chickens vaccinated when vaccines were distributed. The third distribution of vaccines was done a month after the 1st and 2nd part of the 1st vaccination so that the second vaccination took place within a very short space of time so as to boost the first vaccination. The third vaccination was done three months after the booster vaccination.

Table 3.3: Vaccination campaigns done per section.

Section	Vac.1.	Vac. 2.	Vac 3	Application Method
Thoteng	03 June	19 August	1-7 December	Feed
Ditshetlhong	03 June	22 August	December*	Feed
Setlhabaneng	03 June	17 August	Not done	Feed
Ntswaneng	04 June	19 August	4-8 January	Feed
Botshabelo	03 June	30 August	28-30 January	Feed
Manawane	14 June	20 Sept	4-8 January	Water
Senobolo	28 July	24 August	Not done	Water
Methusele	30 June	22 Sept	Not done	Water
Senthumole	01 July	None	Not done	Water

*Vaccinators forgot to fill in the actual dates of vaccination, only the month was indicated.

The vaccination of poultry in the different sections is discussed in more details below.

3.5.2.1 Thoteng

Four vaccinators from this ward volunteered and were trained at home because they were neither at the meeting nor at the original training. The other three women attended the training but never vaccinated at all. The first vaccination campaign was on the third and

fourth of June. The booster vaccination was given two months later, in mid August. The third vaccination campaign was done in the first week of December.

Each time they vaccinated, the vaccinators prepared the vaccine at two different places in the ward so as to be nearer to the chicken owners. The chicken owners collected the vaccine from those two points. The farmers were advised by word of mouth or at funeral gatherings about the date of vaccination campaign. Undiluted vaccines were stored in the refrigerators and those that did not have refrigerators prepared the vaccine within seven days, having stored it in a cool and shaded area.

3.5.2.2 Ditshetlhong

The vaccinators in this section were a man and a woman. The first vaccination campaign was done in the beginning of June with the booster vaccination given in late August. The vaccine was prepared at a central place, which was the headman's home. The chicken owners assembled there for collection. The porridge was only cooked and cooled when enough farmers had assembled. The third vaccination campaign was done five months later i.e. beginning of December and overlapped to the following year. The same method of vaccine collection was used.

3.5.2.3 Setlhabaneng

Five women vaccinators performed the vaccination in this section. Three of them were at the initial training session and the others learned from them (i.e. peer trained). Three of them were chosen at the meeting and the rest volunteered. The vaccination was done at two different points so as to be as close to the chicken owners as possible. This section took part in both the first and second vaccination campaigns only. Just like for the other wards the vaccination campaigns were more or less eleven weeks apart i.e. the first one was on the third of June and the last one was on 22 August. In the first vaccination campaign, those who could easily reach the vaccinators' homes collected the prepared vaccine; most vaccine was, however, delivered to houses by the vaccinators. In the second vaccination campaign the vaccinators informed the farmers to come and collect vaccine for themselves and most did not turn up for collection.

3.5.2.4 Ntswaneng

Three male vaccinators were trained in the initial session, but two of them didn't participate in any of the vaccination campaigns carried out. The remaining trained vaccinator trained another volunteer to assist him with vaccination in this section. This section participated in all the three planned vaccination campaigns. The first vaccination campaign took place in the beginning of June, the second in the 19th of August whilst the third was done in January. A total of seven vials were used i.e. three, two and two respectively. The vaccine vials were taken by the researcher to the vaccinator's home and were stored in a fridge. The vaccine was prepared in-feed at a central place, which was the headman's house. Every farmer had to come and collect for him/herself. The farmers were informed through word of mouth, at meetings and funeral gatherings. The vaccines were prepared when most farmers had gathered.

3.5.2.5 Botshabelo

One female vaccinator was home trained with other home trained vaccinators at Thoteng section. A second woman was peer-trained by the first woman. The section took part in all three vaccination campaigns. The vaccine vial was taken by the researcher to one of the vaccinator's homes and was stored in a fridge, which was always on because she was selling beers. They used the in-feed method of vaccination. Only in the first vaccination campaign was prepared vaccine delivered by the vaccinators to the farmer's houses. In subsequent vaccination campaigns the farmers had to collect for themselves. The vaccination campaigns were on the 3rd of June 30th of August and at the end of January the following year.

3.5.2.6 Manawane

The two vaccinators from this section were trained at the meeting. One of them never vaccinated. The third one was peer trained by the one who performed the vaccination. The section was involved in all three-vaccination campaigns. It used the water method of vaccination. The vaccine vial was taken by the researcher to the vaccinator's place and was stored in a fridge. The first vaccination campaign took place in the middle of June; the second one was immediately after mid September and the third one in early January. Only farmers in the vaccinators' vicinity collected the vaccine. The vaccinator informed farmers in their section through word of mouth. Vaccine was collected from the vaccinator's house.

3.5.2.7 Senobolo

The vaccinators in this section were an elderly man and woman. The headman (Mr. Barileng Merementsi) was trained but he did not attempt to do any vaccination. One of them had never been to school and the other one had only gone up to grade five. This section participated in only the first two vaccination campaigns. The water method of vaccination was used. Vaccine vials were taken by the researcher to one of the vaccinators' homes and stored in a fridge. The farmers had to collect prepared vaccine for themselves. The vaccine was only prepared when the farmers had assembled. In the first vaccination campaign the farmers closer to the first vaccinator collected the vaccine whilst in the second campaign a new batch of farmers closer the second vaccinator came for the vaccine collection. In each case two vials of vaccine were used.

3.5.2.8 Methusele

The section had three vaccinators who volunteered. Only one was home trained by the researcher and he peer trained other two. Transparencies depicting the three methods of vaccination were used for training him. The vaccine vials were taken by the researcher to the home-trained vaccinator's place and was stored in a fridge. The section took part in two vaccination campaigns even though vaccine for the third vaccination campaign was delivered to the vaccinators. The home trained vaccinator who was also the head vaccinator was involved in a water supply project which took up most of his time, so the section failed to participate enthusiastically in vaccination. The first vaccination campaign was on the 30th of June then followed by the second/booster vaccination on the 22 of September.

3.5.2.9 Senthumole

Both the vaccinators were trained at the initial training session. One was chosen by his headman to do the vaccination and the second one was invited by this first one. They used the water vaccination method.

In this section vaccination campaign was only done once in the 1st week of July. The vaccinators took the vaccine vials for the second vaccination campaign but they were never made use of. The farmers collected the prepared vaccine from the vaccinator's house.

3.6 Evaluation of immune status using serology

3.6.1 Sampling for blood collection

Vaccination records compiled by the community vaccinators were used as the sampling frame for the selection of households for serological testing. According to the records kept by community vaccinators, 6 234 chickens belonging to 479 households were vaccinated during the 1st vaccination campaign (See Chapter 4 Table 4.1) It was decided to collect representative serum samples from approximately 10% of the households, which had participated.

Initially it was decided that during the first bleeding campaign seven households would be selected from each section using the systematic sample with random start technique. Three chickens were to be bled from each of the households selected. However, in some of the houses sampled, no one was home and the next house in the list was chosen instead. It also happened that in some of the households sampled, less than three chickens were caught because they were very wild and most of them were not housed. In some households more chickens were caught using the net while they were busy eating and more than three chickens were bled to make up the difference.

Table 3.4: Chickens sampled for bleeding during the first and second bleeding campaigns

Sections Column	Method of vaccination	First bleed				Second bleed			
		Households		Chickens		Households		Chickens	
		Total vac.	Total bled	Total bled	Av.*	Total vac.	Total bled	Total bled	Av.*
Thoteng	F	62	5	17	3.4	32	20	70	3.5
Ditshetlhong	F	45	6	18	3	23	18	82	4.5
Setlhabaneng	F	101	7	14	2	39	0	0	0
Ntswaneng	F	67	6	17	2.8	8	7	24	3.4
Botshabelo	F	63	7	20	2.9	45	6	22	3.5
Manawane	W	41	7	19	2.7	6	5	17	3.4
Senobolo	W	15	7	15	2.1	11	0	0	0
Methusele	W	65	7	21	3	47	0	0	0
Senthumole	W	22	0	0	0	0	0	0	0
Unvaccinated			0	0	0	0	7	28	3.5
Totals		481	52	141	2.7	211	63	243	3.8

*Average number of birds bled per household

In the first bleeding campaign, which took place after the second vaccination, 141 chickens from 52 households were bled (See Table 3.4 above).

In the second bleeding campaign, 214 chickens from 63 households were bled in February and March. As far as possible, households where chickens were bled during the first bleeding campaign and that were vaccinated during the second vaccination campaign were selected for bleeding. In some cases no one could be found at home to allow bleeding to take place. In order to increase the number of households bled, additional households that had not previously been bled were therefore added to the sampling frame.

The majority of the chickens were from two sections (Thoteng and Ditshetlhong) because they were bled first in February and they were the only two sections that had vaccinated for the third time by then. It was then decided that the sections (Ntswaneng, Methusele, Botshabelo, Manawane and Senthumole) would not be bled because it was more than three months since the second vaccination took place. Bisschop *et al* (2005) reported that titres fell if vaccination intervals were longer than 3 months.

During the time of bleeding in Thoteng and Ditshetlhong it was learned that Ntswaneng, Botshabelo, Manawane were busy with preparations to vaccinate. It was decided that those sections would be bled after 4 to 6 weeks. It was also important to sample these

wards because the two wards that were bled first were using the same method of vaccination and samples from the other method were needed for comparison.

Some of the HI titres of the chickens in Thoteng and Ditshetlhong were unacceptably high and it was suspected that a virulent field virus had challenged the chickens. This may have been the reason for deaths, described by some of those who were asked to evaluate the success of the campaign.

A section that was never involved in vaccination was selected as a negative control and bled. It was important to do this as everybody i.e. owners of vaccinated and non-vaccinated fowls, complained about the death of chickens.

Table 3.5: Bleeding dates per section

Section	Bleeding date 1	Bleeding date 2
Thoteng	02 Oct 04	25 Jan 05
Ditshetlhong	02 Oct 04	25 Jan 05
Setlhabaneng	02 Oct 04	Not done
Ntswaneng	02 Oct 04	17 Mar 05
Botshabelo	02 Oct 04	17 Mar 05
Manawane	02 Oct 04	17 Mar 05
Senobolo	02 Oct 04	Not done
Methusele	02 Oct 04	Not done
Senthumole	02 Oct 04	Not done
Control	Not done	17 Mar 05

3.6.2 Blood Collection

A day prior to the day of bleeding farmers were informed by word of mouth that bleeding would be done the following day, so that those with chicken houses would not let them out before the people who did the bleeding came. The farmers were also asked not to feed the chickens early, so that they could easily be caught when eating.

Between 2ml and 4ml of blood was collected from the wing vein of each chicken into a 5ml test tube. To stop the blood from flowing from the chicken after blood collection, the place where the needle incision was made was rubbed with the thumb until it stopped bleeding, thereafter the chicken was released.

The test tubes were given individual numbers for identification. The date of collection was recorded. The blood collected was allowed to stand for a few hours to allow for clotting. A clean paperclip was used to detach the blood clot from the tube and to make serum extraction easy. After clotting, serum was separated into marked 5ml clustar tubes and stored in a fridge in the village then transported in a cooler box by the researcher to the Poultry Reference Centre for testing using the Haemagglutination Inhibition test.

3.6.3 Serological Testing – Haemagglutination Inhibition (HI) Test

A haemagglutination inhibition test (HI) was done on each of the serum sampled, according to the method described by Allan and Gough (1974).

V-bottomed microtitration plates were used for the HI test. The serum samples were diluted in serial twofold dilutions in phosphate buffered saline and then a fixed quantity of viral antigen was added to each well. Four Haemagglutination Units were used, according to the Standard Operating Procedure of the Poultry Reference Centre.

After incubation for one hour, a suspension of red blood cells was added to each well and the plate re-incubated for another hour. In the absence of any antibody against the virus, haemagglutination occurred, appearing as a diffuse red colour at the bottom of the well. In the wells where antibody against the virus was of a sufficient level, haemagglutination was inhibited and the red blood cells sediment appeared as a red dot at the bottom of the well. As is usual, the HI titres were expressed as the logarithm to the base 2. A titre of log 3 to the base 2 was considered indicative of protection and a titre of log6 to the base 2 or more suggestive of a recent infection by the virus. (Saif *et al*, 2003).

3.7 Questionnaires administered to vaccinators

Data collection from 21 community vaccinators was done by questionnaires which vaccinators were given to complete in their own time (Appendix B). The questionnaire was translated to Setswana so that the vaccinators would be able to understand and respond to the questions correctly. The questionnaire was used to gain knowledge of sociological factors affecting the implementation of vaccination campaign within the community.

Some of vaccinators managed to fill and return the questionnaire quickly; others took time before they could return them. The older vaccinators missed some of the questions and did not answer properly. Two did not return questionnaires at all.

3.8 Structured interviews with selected community members

A structured interview was conducted with a random sample of 63 community members in all the nine sections whose chickens were vaccinated using the questionnaire included in Appendix C. Questions included the name of the farmer, age, the section of the village, whether he/she had heard about the vaccination campaign, from whom, if they knew about ND before the campaign, how many of his /her neighbours vaccinated, did not vaccinate and how many have/do not have chickens. Lastly they were asked if they saw the vaccination as a success or not and reasons to support their answer.

3.9 Verification of data supplied by vaccinators by short interviews with community members in three selected sections

The last survey was done in every house (n=?) in three selected wards Appendix D. Ditshetlhong was selected because vaccination in this ward appeared to have been done very successfully and recordkeeping appeared to be accurate. Botshabelo had achieved fairly good results and records appeared to be adequate. In the case of Ntswaneng results and records were poor. The survey was done to find out if the information provided by the vaccinators was correct. The researcher went into each house in the ward concerned and, wherever possible, interviewed the owner of the chickens which in most cases was the mother. The information that was required was: the name of the farmer, the house number, the number of chickens owned by the household and in which vaccination campaigns did s/he participate? His/her level of education and age were also recorded. In the first phase of the survey, the farmers were also asked if they were going to participate in the next vaccination campaign.

3.10 Final feedback meetings with poultry owners in six selected sections

Semi-structured meetings were planned to be held with each section that made an effort to vaccinate. All the meetings were held at a particular point selected by the vaccinator. For Ditshetlhong, Botshabelo and Ntswaneng the vaccinators chose the headmen's houses, whilst for Setlhabaneng, Thoteng and Methusele, the vaccinators chose their houses for the meeting. The aim of the meetings was to find out from the poultry owner

and vaccinators the ways in which vaccination campaigns could be made sustainable. The questions discussed at the meeting are attached as Appendix E.

CHAPTER 4

RESULTS

4.1 Introduction

The results of the research are presented in the same order as the methods:

- Vaccination of chickens by community vaccinators;
- Evaluation of immune status using serology;
- Questionnaires administered to vaccinators;
- Structured interviews with randomly selected community members from all the sections to evaluate whether they had heard about the vaccination campaigns;
- Structured interviews with community members from three sections after vaccination of their chickens, to verify information from vaccinators and
- Final feedback meetings with poultry owners in six sections.

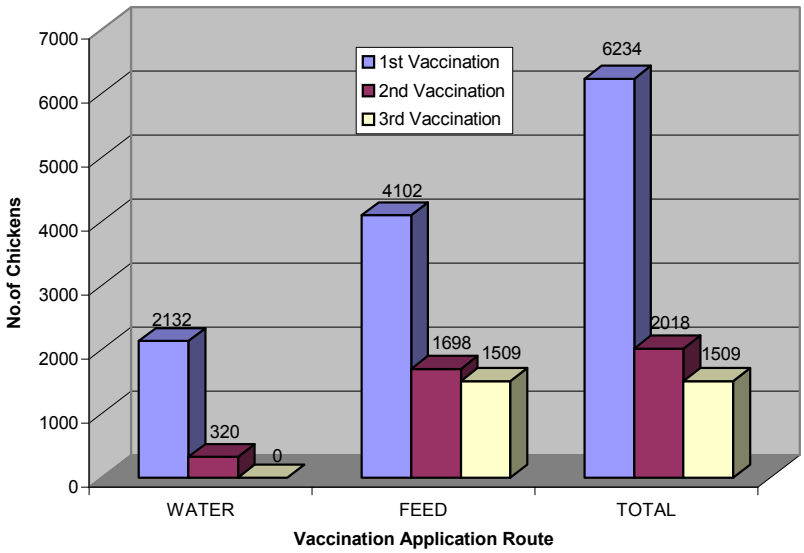
Because all the decisions reached by the focus groups at the community meeting informed subsequent parts of the research method, these outcomes are included under Chapter 3. Similarly, the selection and training of vaccinators is covered under Chapter 3.

The total number of chickens vaccinated via each of the vaccination application routes as well as the total number of chickens vaccinated in each of the campaigns is depicted graphically in Figure 4.1.

4.2 Results of Vaccination of Chickens by Community Vaccinators

The results of the vaccination of chickens in each of the sections are summarized graphically and in tables and then each section is described in detail.

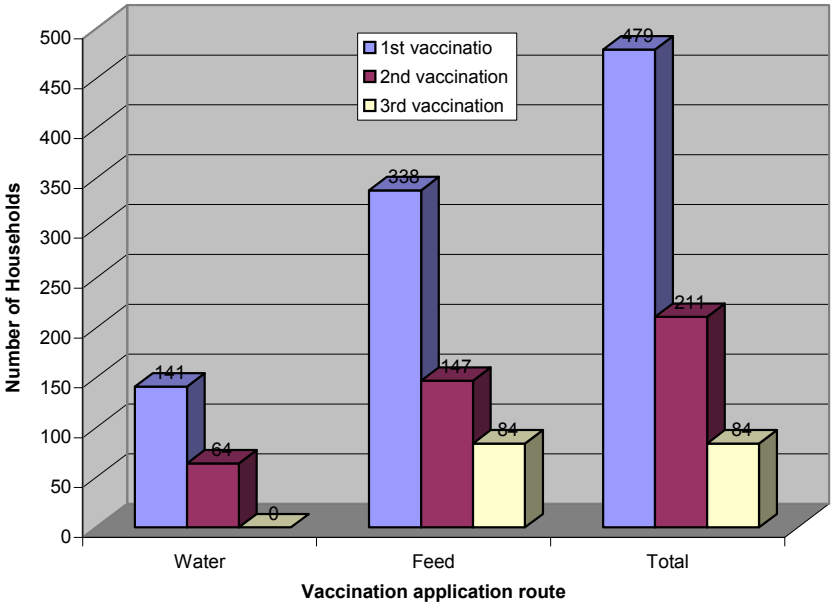
Figure 4.1 Number of chickens vaccinated via each of the vaccine application methods in successive vaccination campaigns



As can be seen in Figure 4.1 above, a total of 6 234 chickens were vaccinated during the first vaccination campaign. This number declined dramatically to only 2 018 chickens, in the second campaign and 1 509, by the third campaign. In the first campaign approximately 66% of the chickens, or 4 102, were vaccinated using the in-feed application method. This proportion increased in the second and third campaigns to 84.1 % and 100% respectively.

On average the percentage participation in the second vaccination campaign was higher for the water method than the feed method, (53.4% and 44.9% respectively). The number of chickens vaccinated using the water method was not recorded during the second campaign and only the numbers of households were recorded. The number of households, which participated in each vaccination campaign as well as the vaccine application routes used are depicted graphically in Figure 4.2.

Figure 4.2 Number of households participating in successive vaccination campaigns



A total of 479 households took part in the first vaccination campaign. The number of households decreased to 211 and to 84 households in the second and third vaccination campaigns respectively.

As can be seen from the graph, more households participated in the feed method than in the water method of vaccination in every vaccination campaign. If one compares Fig 4.1 with Fig 4.2, it can be observed that the number of participating households decreased more quickly than the number of chickens. Generally in subsequent vaccination campaigns, the number of chickens per participating household increased slightly. As for the water method, poor record keeping meant that the results obtained were unreliable.

Table 4.1: Number of households participating and chickens vaccinated per vaccination campaign.

Name of Section	Method used	Campaign 1		Campaign 2		Campaign 3	
		Hshold*	Chickens	Hshold*	Chickens	Hshold*	Chickens
Thoteng	Feed	62	851	32	361	17	No records
Ditshetlhong	Feed	45	703	23	448	35	668
Setlhabaneng	Feed	101	1 051	39	382	Not done	Not done
Ntswaneng	Feed	67	823	8	93	15	579
Botshabelo	Feed	63	674	45	414	17	262
Average (Feed)		67.6	820.8	29.4	339.6	21	503
Total (Feed)		338	4 102	147	1 698	84	1 509
Manawane	Water	41	643	6	No records	No records	No records
Senobolo	Water	15	290	11	No records	Not done	Not done
Methusele	Water	65	750	47	320	Not done	Not done
Senthumole	Water	20	449	0	Not done	Not done	Not done
Average (Water)		35.3	533	21.3	320		
Total (Water)		141	2 132	64	320		
Overall Average		53.2	692.6	26.4	336.3	21	503
Grand Total		479	6 234	211	2 018	84	1 509

Key *Households

On average 67.6 households per section used the feed method, compared to 40.3 households that used the water method during the first vaccination campaign. During the third vaccination campaign, in Botshabelo the number of households reduced further whilst for both Ditshetlhong and Ntswaneng the numbers of chickens increased again after becoming lower during the second vaccination. In general in all the other sections, the numbers of chickens vaccinated in the second vaccination campaign were lower than in the first vaccination campaign but increased above those vaccinated during the second vaccination campaign in the third vaccination campaign (Table 4.1).

The overall average number of chickens per household was 12.5 in the first vaccination campaign and 12.3 in the second vaccination for the feed method. In the water method the average number of chickens per household was 15.5 in the first vaccination campaign and dropped to 6.8 in the second campaign since two (Manawane and Senobolo) out of three sections did not record the number of chickens in the second vaccination campaign. The blank cells under the column headed second vaccination represent data not collected by the vaccinators (Table 4.2).

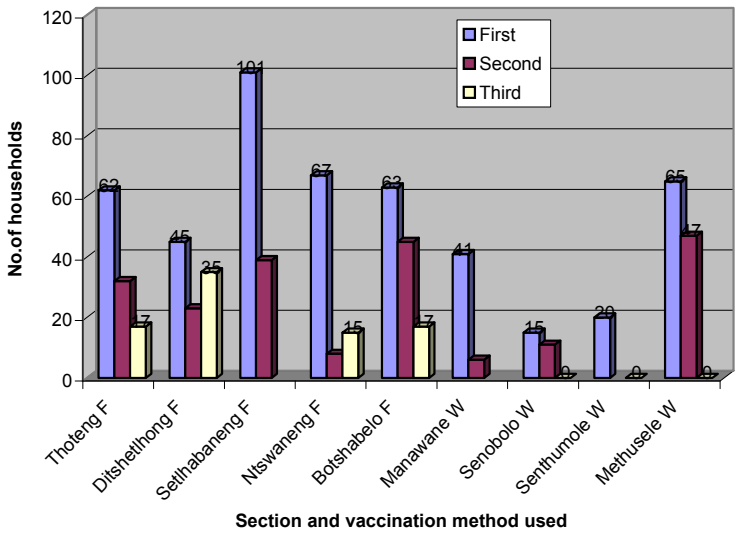
Table 4.2: Average number of chickens vaccinated per section

SECTION	FIRST VACCINATION		SECOND VACCINATION	
Feed	**No birds***	**Birds/hh****	**No birds***	**Birds/hh****
Thoteng	851	13.73	361	11.28
Ditshetlhong	703	15.62	448	19.48
Setlhabaneng	1 051	10.41	382	9.79
Ntswaneng	823	12.28	93	11.63
Botshabelo	674	10.70	414	9.20
TOTAL	4 102		1 698	
AVERAGE	**820.4**	**12.55**	**339.6**	**12.28**
Water	**No birds**	**Birds/hh**	**No birds**	**Birds/hh**
Manawane	643	15.70		
Senobolo	290	19.30		
Methusele	750	11.54	320	6.81
TOTAL	1 683		320	
AVERAGE	**561**	**15.51**	**320**	**6.81**

KEY:
*No birds = number of chickens vaccinated
** Birds/hh = number of birds vaccinated per household on average

Manawane section took part in all three of the vaccination campaigns but the vaccinator did not record the number of chickens vaccinated during the second and third campaigns. The vaccinators in Thoteng did not record the number of chickens during the last vaccination campaign (Table 4.2). No records were available for Senthumole for both the second and third vaccination campaign as the vaccinators stopped vaccinating after the first vaccination campaign.

Figure 4.3: Number of chickens per section in the successive vaccination campaigns



Each section is described separately below under 4.2.1. The data is summarized in Table 4.1 and Table 4.2 and in Figs 4.1, 4.2, 4.3 and 4.4.

4.2.1 Details of the vaccination campaigns in each of the Sections

Details of all the vaccinations from the vaccinator reports that were summarized in the Tables and Figures above are given individually in more detail below.

- *Thoteng*

In Thoteng only 32 of the 62 households (51.6%) that took part in the first vaccination campaign took part in the second vaccination campaign. Only 17 households (27.4%) of those who participated in the first campaign participated in the third. The average number of chickens per participating household in the first and second vaccination campaigns was 10.7 and 9.2, respectively. Unfortunately no records of the number of chickens vaccinated were kept during the third campaign.

- *Ditshetlhong*

In Ditshetlhong 23 of the 45 households (51.1%) that took part in the first vaccination campaign took part in the second vaccination campaign. The number of households that participated in the third vaccination campaign increased to 35 (77.8%) of 1st vaccination campaign. The average number of chickens per participating household in the first, second and third vaccination campaigns was 15.6, 16.3 and 19.1respectively.

- *Setlhabaneng*

In Setlhabaneng 39 of the 101 households (38.6%) that took part in the first vaccination campaign took part in the second vaccination campaign. This section did not participate in the third vaccination campaign. The average number of chickens per participating household in the first and second vaccination campaigns was 9.7 and 11.8 respectively.

- *Ntswaneng*

In Ntswaneng, 8 of the 67 households (11.9%) that took part in the first vaccination campaign took part in the second vaccination campaign. Fifteen households (22.4%) of 1st vaccination campaign participated in the third vaccination campaign. The average number of chickens per participating household in the first, second and third vaccination campaigns was 18.9, 11.6 and 38.6

- *Botshabelo*

In Botshabelo, 45 of the 63 households (71.4%) that took part in the first vaccination campaign took part in the second vaccination campaign. Seventeen households (26.9%)of 1st vaccination campaign participated in the third vaccination campaign. The average number of chickens per participating household in the first, second and third vaccination campaigns was 9.9, 12.6 and 16.2 respectively.

- *Manawane*

In Manawane, 11 of the 15 households (73.3%) that took part in the first vaccination campaign took part in the second vaccination campaign. No records of the number of

chickens were made for the second vaccination campaign. The average number of chickens per participating household in the first vaccination campaigns was 14.6.

- *Senthumole*

In Senthumole, 22 households took part in the first vaccination campaign. This section did not participate in the subsequent vaccination campaigns. The average number of chickens per participating household in the first, vaccination campaigns was 22.5.

- *Senobolo*

In Senobolo, 11 of the 15 households (73.3%) that took part in the first vaccination campaign took part in the second vaccination campaign. The number of chickens that participated in the second and third vaccination campaign was not recorded. The average number of chickens per participating household in the first and second vaccination campaigns was 12.1.

- *Methusele*

In Methusele, 47 of the 65 households (72.3%) that took part in the first vaccination campaign took part in the second vaccination campaign. This section did not participate in the third vaccination campaign. The average number of chickens per participating household in the first and second vaccination campaigns was 11.5 and 6.7 respectively.

4.3 Evaluation of immune status using serology

The HI test calibrated to 4 HA units (in accordance with OIE guidelines) was used, at the Poultry Reference Centre at the University of Pretoria Veterinary Faculty, to test serum samples for antibodies to ND. HI titres greater than 3 were considered positive. Table 4.3 below, shows the results obtained from the HI tests on the serum of vaccinated chickens.

Table 4.3: Results of HI tests done on serum from vaccinated poultry (per section)

Section	Mean 1*	% Protection 1*	Mean 2**	% Protection 2**	Vaccination Method
Thoteng	2.76	35%	3.69	71%	Feed
Ditshetlhong	0.78	11%	2.45	46%	Feed
Setlhabaneng	2.53	62%			Feed
Ntswaneng	1.05	11%	2.38	46%	Feed
Botshabelo	2.4	50%	1.62	1%	Feed
Manawane	2.3	44%	1.06	0%	Water
Senobolo	2.13	26%	***	Not bled***	Water
Methusele	3.09	66%	***	Not bled***	Water
Senthumole	***	***	***	***	Water
Average	**2.13**	**38.11%**	**2.24**	**32.8%**	

* Mean 1 = Mean titres of blood taken from chickens after the first vaccination October 1, 2004

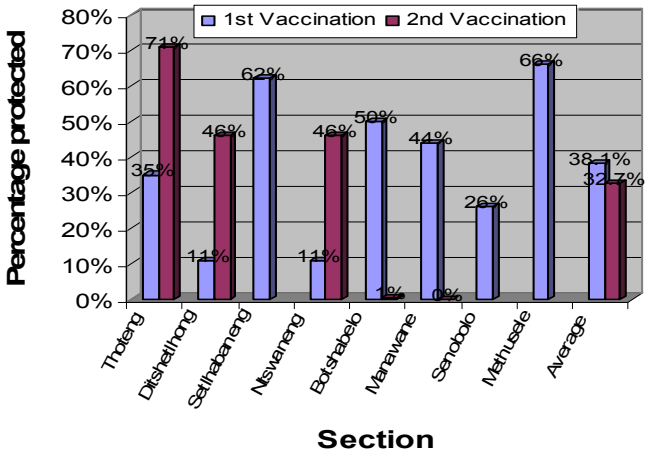
** Mean 2= Mean titres of blood taken from chickens after the second vaccination Feb/March 2005

*** Not vaccinated for a second time

Two (Senobolo and Methusele) of the three sections that used the water method did not revaccinate and in the third section (Manawane), only seven households near to the vaccinator's house took part in the vaccination campaign. Therefore only 17 chickens could be bled. It is possible that the vaccinator did not even revaccinate these chickens as he claimed (Table 4.3).

In Fig 4.4, below, the percentage of chickens showing protective immunity per section ranged from 11% to 66% after the first vaccination. However, after the second vaccination it varied from 0% to 71% although chickens from five sections were bled. In two of the sections bled and tested Botshabelo and Manawane, the titres fell on the second sampling.

Figure 4.4 Percentages of chickens with protective HI titres after vaccination



This could possibly be because they were different chickens, or that the vaccinator was not truthful when s/he said s/he vaccinated for a second time. Apart from these two sections, the other three sections where chickens were re-bled, showed an increased level of immunity, as expected, after the second vaccination.

In Fig 4.5, the mean titres achieved per section are compared. As see in Fig 4.4, chickens from two of the sections that were allegedly re-vaccinated showed a drop in the mean titre, below protective levels. Chickens from three of the sections showed a mean increase in tires, corresponding to the levels of protection shown in Fig 4.4. When looking at the average, the protection generally decreased but this is caused by the fact that a smaller number of chickens were vaccinated in the second vaccination campaign and thus few or small numbers of chickens were bled in some of the sections.

Figure 4.5 Mean HI Titres after first and second vaccinations.

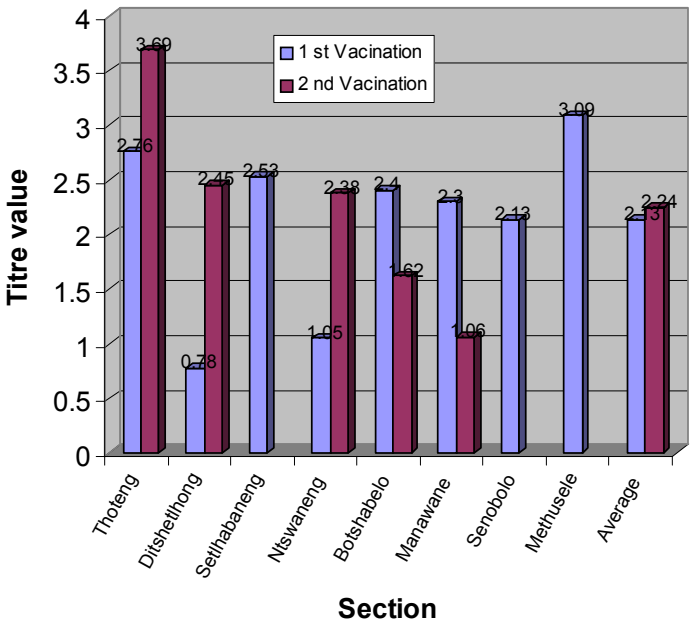
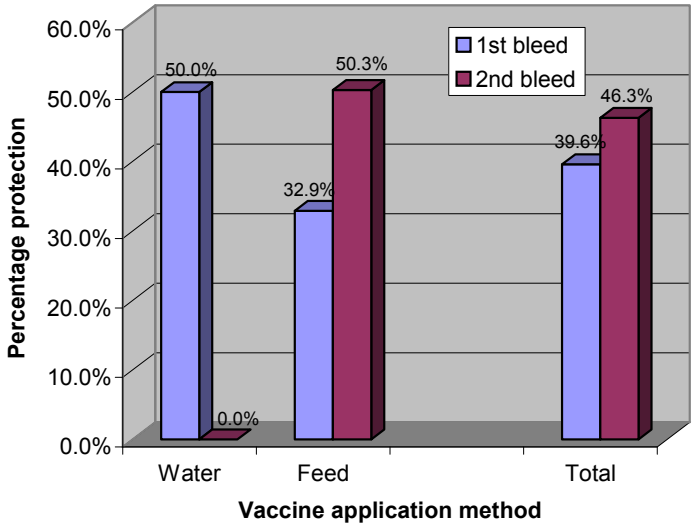


Figure 4.6 compares the titres according to whether the application was through feed or water. From this evaluation, the feed application resulted in an increased titre after the second vaccination, whereas second vaccinations were not done using the water method.

Figure 4.6 Comparing the HI titre obtained using the water and feed methods.



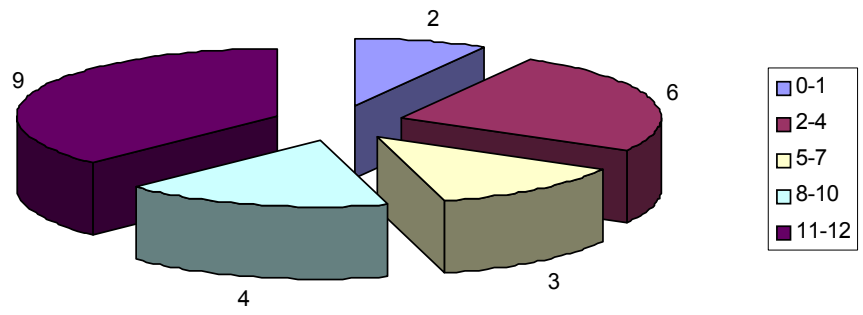
4.4 Results of questionnaires administered to community vaccinators

Printed questionnaires were distributed to vaccinators (n=24) just prior to the first bleeding, after the first vaccination, as described in Chapter 3. The community vaccinator register is attached as appendix A. The structured interview questionnaire with community vaccinators has been included as appendix B. 87.5% (21 out of 24) of vaccinators filled and returned the questionnaire. Demographic data on the remaining three vaccinators was obtained by telephonic interview. The answers to each of the questions are described and discussed below.

4.4.1 Education level

The average number of years of the vaccinator's formal education was 7.8. All except three of them had resided in Disaneng for their entire lives. (Fig 4.7)

Fig 4.7 Education level of community vaccinators in number of years of schooling



4.4.2 Age and gender

Figures 4.7 and 4.8 show the age distribution of the vaccinators, according to gender.

Fig 4.8 Age distribution of male community vaccinators in years

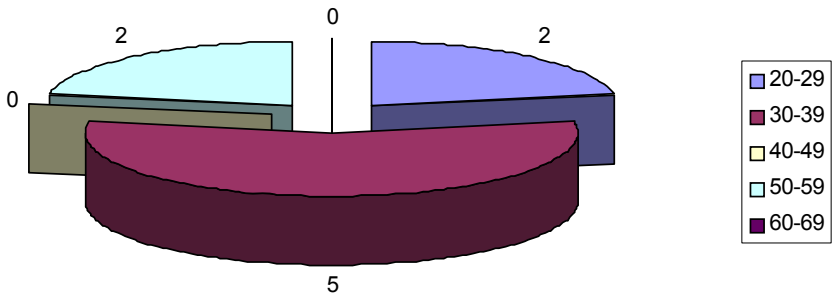
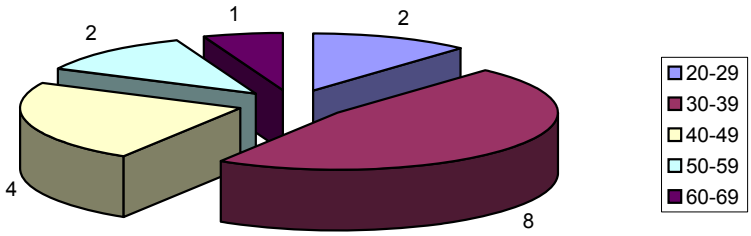


Fig 4.9 Age distribution of female community vaccinators in years



4.4.3 Opinions and perceptions of vaccinators

The reasons for the owners of the poultry not vaccinating, according to the perceptions of the vaccinators, are shown in Table 4.4

Table 4.4: Perceptions on reasons for not vaccinating: group decision by vaccinators in each section

Section	Reasons for people having not participated in the vaccination campaign
1,3	They said they don't want to kill their chickens
2,4,6,8	Came late for vaccine collection
5	They want someone from the government to do the vaccination for them and not the community vaccinators
7	One group came one day and were told to go back and come the following day went back angry and never came back again.
3,5,9	They wanted the vaccinators to deliver the vaccine to them

1=Thoteng 2= Ditshetlhong 3=Setlhabaneng 4=Ntswaneng 5=Botshabelo 6=Manawane 7=Senobolo 8=Methusele 9=Senthumole

In Senthumole, Botshabelo and Setlhabaneng the chicken owners wanted the vaccinators to deliver the vaccine to their houses. In Senthumole the poultry owners said that the vaccinators should deliver the vaccine to their houses as they thought they were hired to do that. In Botshabelo and Setlhabaneng the vaccinators delivered the vaccine to houses but for the second vaccination campaign they wanted the poultry owners to collect for themselves as they (vaccinators) said it was hard work for them.

One group of owners felt that allowing the vaccinators to vaccinate their chickens would result in the death of the birds. This may have been due to an outbreak of ND that killed birds during the study. Owners in one of the sections said that they want the people from the government and not the community vaccinators to vaccinate the birds (Table 4.4).

Vaccinators were asked their opinions on ways previously used to treat birds during ND outbreaks. The results, in rank order, are shown in Table 4.5

Table 4.5: Ways owners treated chickens during previous outbreaks of ND

Treatment	**No.vacc. (n=21)**
Treated them with stock remedies	6
Asked for help from animal health technicians	4
Asked for help from local cooperative	4
Treated them with homemade remedies	2
Received help from local people who knew what to do	2
Received help from the agricultural extension officer	2
No treatment given	1

A list of poultry diseases recognized by vaccinators is listed and ranked in Table 4.6. Note that the second largest group (n=6) did not recognize or describe any diseases.

Table 4.6: Poultry diseases the vaccinators could describe

Poultry diseases recognized by vaccinators	**No.vacc. (n=21)**
Newcastle disease	6
No comment	6
Sneezing	4
Sakhubama (Marek's Disease)	3
Coughing	2
Swollen blackhead with sores	2
Green and white diarrhoea	1

Vaccinators were asked for reasons why they participated in the ND vaccination campaign. The answers are given and ranked in Table 4.7 below.

Table 4.7: Reasons why vaccinators participated in the ND Vaccination Campaign

Reasons	No.vacc. (n=21)
In order to help my community	5
Chickens in my section were dying	5
Encouraged by the author	2
No reason given	2
Chicken death hurts me and I want to rear them	2
Vaccination is great solution	2
I am a chicken grower and make a profit out of it	1
I want to know more about Newcastle disease	1
I want to do poultry business	1

Opinions of vaccinators on how often the communities in each section saw the extension officers are summarized in Table 4.8.

Table 4.8: Opinions of vaccinators from each section on frequency with which community members saw the extension officer

Number of times	No. vacc. (n=21)
When necessary	12
No comment	5
Sometimes	2
Yearly	2

The expectations that vaccinators had prior to the campaign are given in Table 4.9 below. In general, they reflected an expectation that the vaccination of chickens against ND would contribute to the wellbeing of the people in their community.

Table 4.9: Expectations of vaccinators about ND vaccination

Opinion/expectation	No. vacc (n= 21)
Fight deaths in chickens by keeping them alive	5
Protect chickens from being killed by disease	4
Keep ND under control	4
Benefit us in terms of food security	2
Fight diseases and keep them under control	2
We will never lack chickens since we now know how to care for them	2
To have an income from this campaign	1
No comment	1

The answer to the question of who was best placed to make ND vaccination campaigns sustainable are given in Table 4.10

Table 4.10: Opinions of vaccinators on who can make vaccination campaigns sustainable if vaccines are provided free of charge

People listed	No. Vacc (n=21)
Myself	6
Headmen	6
Youth	4
No comment	4
Elderly people	1

4.4.4 Previous experience of ND in the sections

In answer to the question of whether they knew about ND before the extension and skills training that was done after the focus group discussion, 71% did not know about ND prior to this. During this training session, they were taught about clinical signs of ND in fowls. According to their knowledge of clinical signs, they said that previous outbreaks had appeared at different seasons of the year. 62% said the disease occurs in winter, 14% said it occurs in autumn and the rest said they experienced the disease in summer. The last time they had experienced an outbreak of ND in poultry in their sections ranged from 1983 to 2004 and 48% viewed Newcastle Disease as a problem in their area.

4.4.5 Knowledge of the community vaccinators about the vaccine

In answer to the question as to whether they had used the vaccine before, 90.5% of the vaccinators acknowledged that they had never used ND vaccine in their lives. It was the first time that all of them participated in a vaccination campaign.

In response to the question of which method of vaccination they preferred, 67% of the vaccinators preferred the feed method of vaccination whilst the rest preferred the water method and no one preferred the eye-drop method. The reasons for choosing either being that both methods are easy to apply. Those who preferred the water method further said it is good since the chickens drinks every time and those who preferred the feed method said the chickens will all eat and do it very fast.

When asked if they think that it is safe to vaccinate chickens all the vaccinators considered the vaccine to be safe.

4.4.6 How they became community vaccinators

In response to the question were they present at the farmers day, 33% of all the vaccinators stated that they were present. The reason given by those who were at the meeting was that they wanted to know and understand chicken diseases.
When asked how they were introduced to vaccination, they said the people from their sections at the meeting nominated them (14%), their headmen nominated 19% and the rest did not respond to the question.

4.4.7 Training of vaccinators

In answer to the question were they present at the training session, 71% of the vaccinators attended the training session. When asked how then they were introduced into vaccination 48% said by other vaccinators, another vaccinator trained one and the researcher trained the remaining percent at home because they volunteered afterwards. What interested them most about the vaccination campaign was that they learned how to vaccinate and helping others to vaccinate.

4.4.8 Perceptions of vaccinators about death of chickens

In response to the question to the vaccinators, who all were chicken owners as well, about their feelings about the death of their chickens 67% said they felt very bad when chickens died, 10% said they just feel bad and 10% said they did not feel bad, and the rest did not comment. Those who said they feel bad said it is because the number of their chickens is reduced, it is heartbreaking to lose what you have and is important and also because of their love for livestock

4.4.9 Answers to questions on sustainability

Vaccinators were asked several questions about how to make vaccination campaigns sustainable.

When asked what vaccination does in the long term they said it keeps chickens healthy, reduces the death rate, protects chickens against diseases, and increases production.

In response to the question about how vaccination would take place in their absence, 48% said they would ask their co-workers to take over, 14% said they would do it on their

next available free day i.e. holidays/weekends (because some of them were still looking for jobs) and the rest did not comment.

When asked if funerals were a problem to or would hinder the vaccination campaign 52% said no, 19% said yes and the rest did not comment. Those who said no, explained that it was because vaccination would be done during the week while funerals were attended at the weekends, so they will create time for vaccination. Those who said funerals are a problem said that they would be a problem because there are a lot of them nowadays.

4.5 Structured interview with randomly selected community members to evaluate whether they had heard about the vaccination campaign

All the sections were randomly surveyed. The households on the outskirts of the village were in general further from the vaccination points. All in all 63 households were surveyed. The number of households surveyed per section ranged from 4 to 12. The structured interview questionnaire has been included as appendix C

The average age of the people surveyed was 54 years and their average level of formal education was 5.3 years. Only 5% of the total households surveyed were found to have no chickens. The average number of chickens per household for the whole survey was 12.5. Only 7.9% of the people surveyed said that they had not heard about the vaccination campaign. Of all those who had heard about the vaccination campaign and also had chickens, 26.2% decided not to vaccinate.

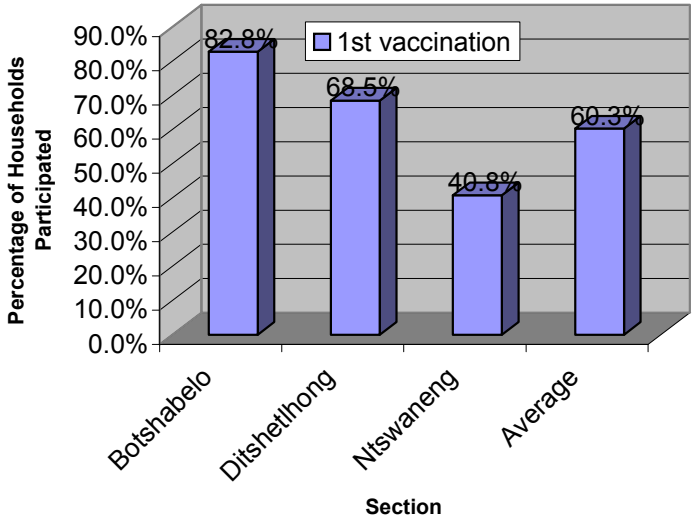
When asked where they had heard about the vaccination campaign, 9.5% of the people said they had heard from their headmen at section meetings or funeral services, 31.7% heard from their vaccinators, 23.8% from their neighbours and the remaining percent from other sources. When asked, 41.3% of the people surveyed said they did not know about Newcastle disease before the first meeting. After the campaign, 68.3% of the people surveyed viewed the vaccination campaign as a success. The remaining percentage was mainly composed of people who said they did not want to comment because they did not have chickens or they would comment if ND broke out again. Deaths of both vaccinated and unvaccinated chickens were reported in their chicks and adult chickens following the vaccination campaign and therefore did not regard the campaign as a success.

4.6 Structured interviews with community members from three sections after vaccination of their chickens, to verify information from vaccinators

After the birds had been vaccinated and bled, three sections were randomly selected for evaluation of the vaccination campaigns. These were Botshabelo, Ntswaneng, and Ditshetlhong. The structured interview questionnaire has been included as appendix D.

Fig 4.10 shows the percentage of poultry owners in each of these wards that participated in the first vaccination campaign. Results of the structured interviews with these respondents showed that the vaccinators' records were correct. The average level of education of farmers, the age of farmers and average number of chickens recorded by both the vaccinators and the survey agreed except where some household had consumed the birds or lost them to diseases, parasites, predators or thieves. In some households the chickens had been transferred to the cattlepost or to a relative in a nearby village.

Fig 4.10: Percentage of households' participation in 1st vaccination campaign.



Survey data also showed that a very large proportion of the community was aware of the vaccination campaign during the second trial at Disaneng and that the majority of chicken owners chose to vaccinate their chickens. Participation in the second vaccination campaign was much lower, but remained more or less stable, at least in certain areas, into the third vaccination campaign. It also appeared from observation of the flocks that the average flock size of respondents remaining in the trial increased – suggesting that

the larger scale poultry keepers continued with vaccinations while households not really engaged in poultry as a farming activity lost interest.

Table 4.11 is a comparison between the percentage of households that participated in the first campaign as a proportion of the total households owning poultry in each section, as well as a comparison between data obtained form the vaccinators and from the owners of the chickens vaccinated.

Table 4.11: Comparison of vaccinators and survey data for first campaign

Variable	**Survey data**			**% of households ***			**Vaccinator data**		
Ward	A**	B**	C**	A	B	C	A	B	C
No of houses	103	131	167				***	***	***
Surveyed houses	96	124	145	93	94	87			
Houses with chickens	58	73	98	60	59	68	***	***	***
Houses without chickens	38	51	47	40	41	32	***	***	***
Houses with chickens that vaccinated	48	50	40	83	68	41	63	45	67
Number of households where all chickens died after they were vaccinated	15	0	27				***	***	***
Houses not vaccinated	10	21	58				***	***	***
Average age of farmer	56.9	53.1	52.4				56.7	56.4	***
Average level of education	3	5.3					3.0	5.3	5.3
Number of chickens at the time of survey and in the first vaccination campaign	569	1 007	1 075				674	703	823
Number of chicks	221		252				***	***	***
Totals	790		1327						

* Percentage of households with chickens in that section that participated in the first vaccination campaign

** A= Botshabelo section, B= Ditshetlhong, C=Ntswaneng

***No records made by the vaccinators

The three sections are discussed in more detail below

4.6.1. Botshabelo

According to the survey, the number of households that the vaccinators recorded at Botshabelo is more than those in the survey record.

In the second vaccination campaign (18 of 63) 28.6% households that took part in the first vaccination campaign did not revaccinate. In the third vaccination campaign 17

households participated. Of all these households 3 were vaccinating for the second time, one was from the neighbouring section and the rest were vaccinating for the third time. In the third vaccination campaign 262 chickens were vaccinated from these households

The survey indicates that 48 households participated in the vaccination campaign at least twice. The number of households shown by the vaccinator's list is highest in the first campaign while the second is higher than the third campaign.

4.6.2 Ditshetlhong.

In Ditshetlhong 124 households were surveyed and out of these 73 households had chickens. 70% of the households with chickens participated in the vaccination campaign. According to the vaccinator's records, in the first vaccination campaign 45 households participated with about 703 chickens. The number of households that participated decreased to 27 with about 440 chickens during the second campaign. In the third vaccination campaign, 35 households with about 668 chickens participated.

Out of all the households in Ditshetlhong that took part in the vaccination campaigns, 10 households took part once, 16 households twice and 19 households three times. In the third vaccination campaign 7 households took part for the first time. The survey recorded 1007 chickens plus 341 chicks in this section whilst the vaccinator vaccinated only 703 birds. The average number of chickens owned by the farmer per household at the time of the first vaccination campaign was 15.6 and 16.3 at the time of the second vaccination campaign. An average of 19.1 chickens per household was recorded during the third vaccination campaign.

There was no difference in the average level of education among the chicken owners, which was an average of 5.3 years of schooling, recorded by both the survey and the vaccinator.

4.6.3 Ntswaneng.

Record keeping in this section was a problem. The vaccinators only recorded the number of households, and not chickens that participated in the vaccination campaigns. No other additional information such as the level of education and ages of the farmers were recorded. According to the vaccinators 67 households with about 1 268 chickens participated in the first vaccination campaign. In the second vaccination campaign 8

households participated with about 93 chickens and in the third vaccination campaign 15 households with about 579 chickens participated.

145 households were surveyed in this section. 98 households owned chickens in their backyards. 40 households participated in the vaccination campaign at least once. The average age of the farmers in this section was 52.4 as recorded by the survey. All the entire section had 1 075 chickens and 252 chicks at the time of the survey.

4.7 Final feedback meetings with poultry owners in five selected sections

Confirm description in method.

Tables 4.12 to Table 4.22 show the answers to questions to the poultry owners who participated in the vaccination campaigns and vaccinations. The structured interview questionnaire has been included as appendix E.

Table 4.12: Number of farmers who attended the meeting per section

Section	**Number of farmers who attended the meeting per section**		
	Male	Female	Total
Thoteng		3	3
Ditshetlhong	3	5	8
Setlhabaneng	2	9	11
Ntswaneng		1	1
Methusele		11	11
TOTAL	**5**	**29**	**34**

Table 4.13: Expectations about chickens after vaccination

Section	**Expectation**
Thoteng	Increase in production
Ditshetlhong	Production will increase and chickens will be protected from general diseases
Setlhabaneng	Protection against disease
Ntswaneng	No death
Botshabelo	No death
Methusele	Chickens to be protected against diseases

The farmers seem to have thought that the vaccine was going to cure all the diseases that affected their chickens. (Table 4.13)

Table 4.14: Were expectations met?

Section	**Answer**
Thoteng	No
Ditshetlhong	No
Setlhabaneng	No
Ntswaneng	No
Botshabelo	No
Methusele	No

Their expectations were not met because deaths in their chickens occurred even though the chickens were vaccinated. (Table 4.14)

Table 4.15: Do you believe that any of your chickens died as a result of vaccination?

Section	Reason
Thoteng	Yes
Ditshetlhong	No
Setlhabaneng	No
Ntswaneng	I cannot respond on behalf of people who are not here
Botshabelo	Yes
Methusele	We thought that because death took place immediately after vaccination

Many farmers did not know how exactly the vaccine works and said the vaccine caused death. There were those who admitted that there had been deaths both before and after vaccination, but they did not attribute the deaths to vaccination. (Table 4.15)

Table 4.16: If a vaccination campaign proceeds are you going to participate?

Section	Reason
Thoteng	The vaccinator from the section said she does not think they will, as they were not even there to tell their grievances.
Ditshetlhong	Yes, we are eager to take part.
Setlhabaneng	We really will.
Ntswaneng	The headman's wife said she does not think they will all come.
Botshabelo	They blamed the vaccine for killing their chickens, so said they are not going to continue.
Methusele	After understanding the purpose of vaccination, they said they are prepared to participate in the campaigns.

Irrespective of farmers who did not want to continue vaccinating, there were some who were still eager to vaccinate and realize the importance of vaccination. (Table 4.16)

4.7.1 Specific questions to the community vaccinators

How many vaccinators took part in this exercise?

Table 4.17: Why didn't farmers participate in the second vaccination campaign?

Section	Reason
Thoteng	The farmers complained of chicken deaths
Ditshetlhong	They complained of chickens not laying, becoming broody and chick mortality
Setlhabaneng	They said their chickens died because of vaccination
Ntswaneng	They said the vaccine is killing their chickens
Botshabelo	They strongly believed that the vaccine is responsible for the deaths of their chickens
Methusele	They thought that it was the vaccine that was killing their chickens since it occurred after vaccination

The vaccinators and poultry owners had different reasons for the decline in participation. (Table 4.17) Why and decribe how they differed.

Table 4.18: After receiving vaccines what did you do with them?

Section	Reason
Thoteng	Immediately started informing the people about the day of the campaign
Ditshetlhong	Tell my headman to inform farmers at my section's funeral services
Setlhabaneng	Inform my headman, schoolchildren nearby and my neighbours to spread the news of the set date.
Ntswaneng	The headman's wife told her husband to tell the farmers of the set date
Botshabelo	Start informing the farmers about the set the date
Methusele	The vaccinator was always busy with projects that operated in the village and performed the vaccination when he was free and that after a long time that even exceeded the set vaccination interval.

The vaccinators made a great effort to inform the chicken owners about the day and time of vaccination. (Table 4.18)

Table 4.19: Where was the vaccine stored?

Section	Reason
Thoteng	In the refrigerator or under the bed if I don't have more things in the refrigerator.
Ditshetlhong	In the refrigerator.
Setlhabaneng	In the refrigerator.
Ntswaneng	The headman's wife didn't know how it was stored since only the preparation and collection was done at her house.
Botshabelo	In the refrigerator.
Methusele	The vaccinator's sister said they stored it in the refrigerator that is always on. The vials for the third vaccination, which was not yet done, were still there.

Vaccinators had the refrigerators to store the vaccine but they said they did not always have money for electricity to keep them running. (Table 4.19)

Table 4.20: How long did you store the vaccine before you used it?

Section	Reason
Thoteng	Maximum of five days
Ditshetlhong	One to three weeks
Setlhabaneng	Up until the day set for vaccination
Ntswaneng	No vaccinator to respond
Botshabelo	Until all the farmers agreed on the same day
Methusele	The vaccinator was not there

Storage seems to have been a problem to some of the vaccinators as they said they could not just put the refrigerator on for the vaccine. (Table 4.20)

Table 4.21: How long after reconstituting it, did you give vaccine to people?

Section	Reason
Thoteng	Within two hours
Ditshetlhong	Within two hours
Setlhabaneng	Within two hours
Ntswaneng	No vaccinator to respond
Botshabelo	Within two hours
Methusele	The vaccinator was not there

All the vaccinators said that they always made it a point that the reconstituted vaccine is collected within two hours. (Table 4.21)

Table 4.22: Did you expect money because you participated in the vaccination campaign?

Section	Reason
Thoteng	Yes
Ditshetlhong	Yes
Setlhabaneng	Yes or anything in kind
Ntswaneng	Yes
Botshabelo	Yes
Methusele	The vaccinator was not there

CHAPTER 5

DISCUSSION

5.1 Opportunities and constraints to vaccination by community vaccinators

Approaching the community at Disaneng via the traditional tribal structure was highly effective with a high percentage of community members being informed of the process and over 60% of chicken owners in the targeted village agreeing to vaccinate their chickens when this was available at no cost. Good co-operation was obtained during community meetings and focus groups. During the focus group discussions, the groups chose not to do eye drop vaccination as it meant catching chickens. The training was successful and initially, volunteers were very motivated. If vaccinators are successful, then a mechanism can easily be found to supply vaccines at a central point to vaccinators – either by means of state subsidized or private services.

However, thereafter there were several constraints to success:

- Although the vaccinators promised to collect the vaccines at a central point, they did not. For the first vaccination they collected the vaccines at the community hall. For the second and third vaccines, a few (5) came to the hall, but the researcher had to deliver the rest personally to each vaccinator at their houses - this may not be practical on a large scale.
- Even for the first vaccination, one section's records appeared as if they were fabricated. For the second vaccination, full records were not kept for two (Manawane and Senobolo) sections. There would either be number of households that participated and no number of chickens from those households or nothing at all. For the third vaccination, only three vaccinators kept records.
- Only eight sections did a second vaccination. Five used feed administration and three used water administration but poor or no records were kept of the water-administered vaccination.
- Five sections did the third vaccination. Only three kept full records and the fourth one only recorded the households that participated.
- The number of chickens varied significantly from one vaccination to the other. As they were not marked, it is likely that some chickens did not get vaccinated in every vaccination campaign. This would reduce the efficacy of vaccination. Horizontal spread of vaccine from vaccinated to unvaccinated chickens would, however, help to reduce this problem.

Community vaccinators were able to vaccinate chickens and individual volunteers also played a significant role in the success of vaccination in different sections. However, after the first vaccination, many of the vaccinators were no longer as motivated and stopped vaccinating. Some lessons were learned from this. Community vaccinators should not be actively engaged in a search for other employment and would probably co-operate better if paid for their services – either by external agencies or by community members.

The owners themselves were also not motivated to continue with vaccination. In two sections, the owners blamed the vaccinators for the deaths of poultry after vaccination. It was possible that this was due to an outbreak of ND, although it may also have been due to some unexpected negative effect of the lentogenic type vaccine used. Thekisoe (2004) suggested that vaccines could adversely affect backyard chickens that were severely malnourished. High levels of internal parasites such roundworms and tapeworm often seen in backyard chickens can also negatively affect the immune system.

Although almost two out of three households in Disaneng keep chickens, most are not actively farming with them. Indigenous chickens are generally seen as a useful resource to be used in times of need but probably not as a significant contributor to household income. It is likely that households are therefore reluctant to invest time or money in the health of the chickens. In a very small proportion of households, the chickens are actively farmed and contribute significantly to household income; in these households there is a greater willingness to invest in the chicken flock. Therefore, in most households, the deaths of these indigenous chickens are not as important to them as they would be if they were actively rearing broilers or keeping layers to get an income from birds or eggs. It is probable that these owners would be more motivated to vaccinate or use trained vaccinators. Their chickens are also likely to be better fed and have some parasite control done, as there is an economic reward for faster growing chickens.

In the case of vaccination campaigns in a village setting it is important to have vaccinators who are well prepared to undertake the vaccination campaigns at specific arranged times, able to keep records and inform all farmers prior to the vaccination campaign. The vaccinator should be prepared to sacrifice some of his/her time i.e. four times in a year. This was mentioned to the community vaccinators; however they did not seem to realize how much work or time this would involve. There may also have been an unspoken anticipation that this would lead to employment in the long run. They were obviously

looking for permanent employment as in some cases vaccinators found other employment and were no longer available to vaccinate.

To accommodate the time lag involved in distributing the vaccine to the vaccinators and the vaccine actually being used on the chickens, an even more thermostable vaccine than Inkukhu® may be an advantage.

Lack of record keeping was a problem, as was the fact that chickens are not easy to identify individually. The variation in numbers may be due to the fact that chickens are eaten and then new ones are purchased to add to the flock. Theft of chickens may also have played a role. It is suspected that ND also broke out during the vaccination campaign, as in some sections a high mortality was reported. Sticktight fleas were also very common and may have contributed to the deaths of young chicks during the campaign, as these parasites surround the eyes so closely that the chicks cannot see to eat and drink.

5.2 Immune status and serology

Mean serological titres achieved varied dramatically between sections from 0% in Manawane in the second bleed to 71% at Thoteng in the same bleed. The mean serological titres and percentage protection level for Thoteng, Ditshetlhong and Ntswaneng improved between the first and second bleeds whilst both the mean and the percentage protection level of Botshabelo dropped in the second serological tests. The overall mean protection level of 35.5% was lower than that achieved during the studies by Bisschop *et al.* (2005). In those studies, experienced staff stored and handled vaccine carefully, reconstituted it according to the manufacturer's directions and vaccinated chickens using the feed, water and eye-drop methods.

The main reason for failure was not that the community vaccinators did not know how to vaccinate the chickens, but that they did not comply with all the instructions regarding proper handling, storage and application of the vaccine.

Although community vaccinators involved in the current study, were instructed to store vaccine in the refrigerator, it is not possible to determine whether or not this actually happened. In at least one case a community vaccinator admitted that although she had a refrigerator she had not switched it on, as there was nothing else in it. Vaccine was generally collected from a central point in each ward during vaccination and then chicken

owners would walk home with it. In many cases vaccine probably did not reach chickens within an hour of reconstitution. It raises the question if vaccine was properly stored or was the cold chain broken during this delay in vaccination.

Another reason for the low antibody titres when the community vaccinators vaccinated, compared to those done by technicians can be attributed to the fact that the technicians used a car for distribution and the distribution was done in less than an hour after reconstitution. With the community vaccinators, the chicken owners went a long way on foot to collect vaccines, sometimes during very hot weather. This might have contributed to the loss of effectiveness of the vaccine, even although it is relatively heat stable.

The vaccination campaign intervals were not followed as recommended; this may have resulted in the decline in titres observed at the second bleed in some of the sections. The dates of vaccination given by the community vaccinators may also not have been accurate.

Protection levels obtained by water vaccination (50%) were better at the first bleed than those obtained through the feed (32%). By the second bleed, birds vaccinated through the feed had reached a mean protection level of 51%, unfortunately poor compliance in water vaccinated sections meant that no protection level could be calculated for in-water vaccination at the second bleed.

5.3 Questionnaires administered to vaccinators

The community vaccinators had an average of 7.3 years of education with 37.5% (9/24) having 11 to 12 years of schooling. The average educational level of the poultry farmers surveyed at Disaneng was 5.3 years. Community vaccinators were generally better educated than the community from which they were drawn. However, there were also 8 vaccinators (33.3%) who had four or less years of education. There were more women (59%) than men who participated as vaccinators. Half of the vaccinators were 30 to 39 years old.

Vaccinators in the 20-39 year old age groups were young enough to carry out vaccination but many would have been actively seeking employment, while older vaccinators often were poorly educated and had difficulty maintaining adequate records.

In the first vaccination campaign many households were involved in each section. A decline in participation was observed in the subsequent vaccination campaigns. This was due to various reasons.

One was because many chickens died after the first vaccination campaign, possibly as a result of a ND outbreak at the time. Farmers did not come to collect vaccine because they wanted the vaccinators to deliver the vaccine to their houses. Some did not trust the community vaccinators to do vaccination correctly and wanted the government to do it. (Refer Table 4.4) The vaccinators on the other hand got paying work inside and outside the village, e.g. water and electric supply projects, and lost interest in vaccinating.

In treating previous outbreaks of ND, many vaccinators consulted health technicians, local cooperatives and made use of stock remedies. Most vaccinators recognized diseases like ND, and other respiratory diseases and Marek's disease. Most of the vaccinators said that they participated in the ND vaccination campaign so as to help their community and also because there were chickens dying in their sections. They expected that chickens would be protected from diseases and vaccination would keep ND under control. Later questions showed that these expectations were not met and this probably was one of the reasons why they became demotivated.

If vaccines are provided free of charge, most of the vaccinators said it would be either they or the headmen who would be able to make the vaccination campaign sustainable. In the long run, however, despite co-operation from both the community vaccinators and all the headmen of the sections, the campaign did not appear to be sustainable.

It was possible that the vaccinators who chose the water method were lazy and they just chose it because it is quick and not time consuming, as the other method required cooking of porridge. It appears that old people stopped vaccinating and kept poor records from Senobolo and Manawane. The vaccinator for Manawane was involved in farming activity at a distant dam in the village and the two vaccinators from Senobolo- the woman was widowed and the man was a headman who spent most of his time at the chief's court.

The vaccinators from Senthumole and Botshabelo always insisted on wanting to be paid. The vaccinators in the other sections also wanted money or anything in kind as a payment but they were not as insistent as those in the abovementioned sections.

5.4 Evaluation of whether communities had heard about the vaccination campaigns.

In general, the community was well informed about vaccination capaigns. People were informed through word of mouth about the vaccination day. This was done at places where people met but the vaccinators were the ones who always informed the farmers in each section.

Only a very small percentage of the villagers surveyed said they had not heard about the vaccination campaign.

Comment [SPR1]: You need to give an actual percentage.

5.5 Discussion of structured interviews with selected poultry owners

When comparing the average age and education level of farmers, there was not much difference between survey data and data recorded by the vaccinators. Some discrepancies were found between survey and vaccinator data in terms of the number of households and chickens that were vaccinated in each of the sections surveyed. This was possibly caused by the fact that vaccinators did not include the chicks in their records and these were now mature, also, some chickens would have already have been lost or consumed by the time of the survey. The large number of households that lost their all their chickens after the first vaccination campaign at Ntswaneng raised a doubt as to whether the chickens were ever vaccinated as in the first vaccination campaign the vaccinator in that section gave only the initials of the poultry owners. It is possible that even the ages they recorded were fabricated.

5.6 Discussion of the final feedback meetings with poultry owners in five sections.

The majority of the people who attended the meetings were women. Those from Setlhabaneng, Ditshetlhong and Methusele were still eager to continue vaccinating. It was only at Botshabelo that a mob of angry chicken owners came and said they did not want to continue vaccinating. In the other sections all the people who did not want to continue vaccination just did not turn up for the meeting. In the Methusele section the people said that they were not clear about the concept of vaccination as deaths of chickens have always occurred, even immediately after vaccination. They could therefore not understand why vaccination should be done.

The chicken owners said that they thought that their chickens were going to be protected against all diseases and also increase in production. What they experienced was more

deaths where they had been previously and new ones where they had not occurred before vaccination. The all said that their expectations about vaccination had not been met. In both Botshabelo and Thoteng they said that they believed that their chickens died because of the vaccine. For Thoteng the vaccinators said that some farmers did not turn up for the meeting because of that.

In Methusele the farmers had mixed feelings because their chickens died even before vaccination. They said they thought it was due to the vaccine but after a discussion they realised it was probably not. Only those farmers who attended the meeting at Ditshetlhong, Setlhabaneng and Methusele said they still want to continue with vaccination. The vaccinators who turned up for the section's meeting said that farmers had been very rude to them and that they also felt discouraged and demotivated during the second vaccination.

Despite being advised from the beginning of the project that no-one would be paid, all the vaccinators who were at the meeting said they had expected to be paid for the work they had done.

It was established from the vaccinators at the meetings that they generally waited for everyone to assemble at the control point before reconstituting vaccine and sharing it among those who were there. Many community members did not take heed of the vaccination times set and later came up with reasons why they could not come for vaccine collection. The vaccinators in all the sections where meetings were held had refrigerators to store the vaccine but preferred not to keep it for a long time after receiving it.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

ND Nobilis Inkukhu vaccine can be used successfully to immunize village chickens against Newcastle disease. It is probably not, however, the ideal product and further investigation into alternative products is still merited. Vaccines that are more robust after re-constitution and can be supplied in smaller quantities than the 500 doses of Nobilis ND Inkukhu would be valuable.

Much further work is needed to make South African policy makers aware of the importance of village poultry production. The result of this work shows the following:

- It is possible to successfully train lay people to vaccinate village chickens against Newcastle disease;
- The in-feed method of vaccine application proved most successful and sustainable in the Disaneng community. In-water vaccination may work as well;
- The methods used worked when done by experienced vaccinators with proper control but did not work as well when done by community volunteers;
- The vaccination campaign using volunteer vaccinators was not successful because it did not result in sufficient fowls getting a protective level of antibody. This was probably because the volunteers were demotivated, did not keep records, could not communicate well or motivate the community- even although they were given sufficient training;
- These findings are very important because it means that for a significant protection of backyard chickens against Newcastle disease only two ways are possible
    1. The state must find the resources to pay vaccinators to do the work.
    2. Owners of chickens must be motivated enough to do it themselves.

Otherwise, when Avian Influenza comes along the same situation of endemic disease in backyard chickens, as exits with ND, is going to happen.

While studying the demographics of poultry keeping at Disaneng, it emerged that flocks varied dramatically between counts as little as a few months apart. The reasons for this as well as the husbandry and social practices associated with poultry keeping in the rural context of South Africa require further detailed investigation.

6.1 RECOMMENDATIONS

With community volunteers having not worked well, it is suggested that other options could be considered for application of Newcastle disease vaccine.

1. Interested farmers could be taught to vaccinate through community trainers who can be paid through skills training levies, if the course is registered with the South African Qualification Authority.
2. The state should vaccinate - it should be made a priority to find a budget.
3. It would probably be more constructive to prioritise help to community members who have a real interest in poultry production, rather than trying to vaccinate all the chickens in the community.

CHAPTER 7

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ANNEXURE A:

CHICKEN FARMERS REGISTRATION FORM

Name of farmer	House No.	Male/female	Grade	No. of Chicken	Experience with chicken	Age Of Farmer

ANNEXURE B:

QUESTIONAIRE FOR THE COMMUNITY VACCINATORS

EVALUATION OF THE APPLICATIONO F A THERMOSTABLE NEWCASTLE DISEASE VACCINE BY COMMUNITY VACCINATORS AT DISANENG VILLAGE, NORTH-WEST PROVINCE SOUTH AFRICA

DATE: …… **Time:……**

A OWNERS PARTICULARS

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1. Name: ☐ V_1 1

2. Gender Male ☐ Female ☐ V_2 2-4

3. Age ☐ V_3 5

4. Village ☐ V_4 6

5. How many years of formal education do you have?

☐ yrs ☐ mnths V_6 7

6. For how long have you resided in this village?

☐ yrs ☐ mnths V_7 8

7. Where did you reside before moving to this area? (Choose one) V_8 9-12

City	☐	V_9	13
Commercial farm	☐	V_{10}	14
Other homeland	☐	V_{11}	15
Other (specify).		V_{12}	16

Specify.

8. Number of dependants ☐ V_{13} 17

How?

V_{14} 18

9. How many chickens do you have? V_{15} 19

10. How long have you been involved in chicken farming? V_{16} 20

11. Do you know how many households there are in your ward? V_{17} 21

1☐ Yes 2☐ No V_{18} 22

12. How many of these households… V_{19} 23

Vaccinated ☐ V_{20} 24

Did not vaccinate ☐ V_{21} 25

13. If not why? V_{22} 26

B. HEALTH AND DISEASES

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14. Do you know about poultry disease?

1□	2□		
Yes	No	V_{23}	27

15. Describe and name the poultry diseases you know about V_{24} 28-29

16. Did you know about Newcastle Disease before the start of the vaccination campaign?

1□	2□		
Yes	No	V_{25}	31

17. If yes, in which season of the year do you mostly have an outbreak of ND

Summer	1	□	V_{26}	32
Autumn	2	□	V_{27}	33
Winter	3	□	V_{28}	34
Spring	4	□	V_{29}	35

18. When was the last time you can remember an outbreak of Newcastle disease in your area? V_{30} 36

19. Is Newcastle disease a problem in your area

1□	2□		
Yes	No	V_{31}	37

20. How do you handle an outbreak of Newcastle Disease in chickens?

Treat them with homemade remedies	□	□	V_{32}	38
Treat them with stock remedies	□	□	V_{33}	39

Get help from local people who know	☐	☐	V_{34}	40
Get help from animal health technicians	☐	☐	V_{35}	41
Get help from the extension officer	☐	☐	V_{36}	42
Get help from local cooperative	☐	☐	V_{37}	43

If others specify V_{38} 44

21. Have you ever vaccinated your chickens for any disease before this vaccination campaign?

1☐	2 ☐
Yes	No

V_{39} 45

22. Which diseases? List

V_{40} 46

23. Where did you get vaccines? from V_{41} 47

24. Which other remedies do you use? V_{42} 48

Specify V_{43} 49

25. In which year did you participate in the Newcastle disease vaccination? V_{44} 50

2002	☐
2004	☐
Both	☐
None	☐

26. Why did/didn't you participate? Give reasons V_{45} 51

27. Which of the following methods do you prefer? V_{46} 52

Ey e-drop	□
Water	□
Feed	□

Why? (Give reasons) V_{47} 53

28. Do you think it is safe for chickens to be vaccinated? V_{48} 54

29. What is your opinion and expectation about ND vaccination? V_{49} 55

30. Are you prepared to pay for ND vaccinates in the future? V_{50} 56

1□	2□
Yes	No

V_{51} 57

31. Were you present at the Farmers Day/meeting

	V_{52}	58

Why did you attend (if answer is yes) V_{53} 59

Why did you attend (if answer is no) V_{54} 60

32. Were you present at the training session for ND V_{55} 61

1□	2□
Yes	No

V_{56} 62

33. who introduced you into vaccination campaign? V_{57} 63

34. Who trained you? V_{58} 64

35. What interest you much about ND vaccination Campaign? V_{59} 65

C. GENERAL

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36. How often do you see your extension officer (Mr Molemise)? **V_{60}** 66

Sometimes	☐
Yearly	☐
When necessary	☐

*Other ☐

Please specify **V_{61}** 67

37. How do you feel about the death of your chickens? **V_{62}** 68

Not bad	☐
Bad	☐
Very bad	☐

Why do you feel this way **V_{63}** 69

+

38. What does vaccination do for your chickens in the long term? **V_{64}** 70

39. When it is time for vaccination and you are not available, how would you make it possible? **V65** 71

40. Who can do a ND vaccination campaign every 3 month in this village if vaccines are provided? **V66** 72

Myself	☐
Youth	☐
Headmen	☐
Elderly people	☐

Others Please specify

V_{67} 73

41. Do funerals affect the vaccination campaign?

1☐	2☐
Yes	No

V_{68} 74

ANNEXURE C:

STRUCTURED INTERVIEW WITH SELECTED COMMUNITY MEMBERS

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1. Ward: V_{69} 75

2. House No V_{70} 76

Date:

Name of the farmer V_{71} 77

3. Level of education V_{72} 78

4. Age of the farmer V_{73} 79

5. Do you have chickens?

1□	2□
Yes	No

V_{74} 80

If yes how many V_{75} 81

6. Did you hear about vaccination? V_{76} 82

1□	2□
Yes	No

V_{77} 83

7. From whom did you hear about vaccination? V_{78} 84

a) Headman	□	V_{79} 85
b) Vaccinator	□	V_{80} 86
c) Neighbors	□	V_{81} 87
d) Others		V_{82} 88

8. Did you know what Newcastle Disease was before this? V_{83} 89

1□	2□
Yes	No

V_{84} 90

9. How many of your neighbors? V_{85} 91

Yes	Vaccinated	Did not vaccinate	Have no chickens	Total
Number				

V_{86} 92

10. Do you thing this vaccination campaign was a success: V_{87} 93

1□	2□
Yes	No

V_{88} 94

11. Reasons V_{89} 95

12. Discussion/Notes V_{90} 96

APPENDIX D

VERIFICATION OF DATA SUPPLIED BY VACCINATORS BY SHORT INTERVIEWS IN THREE SELECTED SECTIONS

SECTION…….DATE……

	Name Of Farmer	House no	Age Of Farmer	Did You Vaccinate			No. Of Chicks	No. of Chickens
1.				1	2	3		
2.								
3.								
4.								
5.								
6.								
7.								
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38.								
39.								

ANNEXURE E:

FINAL FEEDBACK MEETINGS WITH POULTRY OWENRS IN SIX SELECTED SECTIONS

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1. Why did you participate in the vaccination campaign? V_{91} 97

2. What did you expect would happen after your chickens V_{92} 98

3. Did this happen? V_{93} 99

4. Do you believe that any of your chickens died as a result of vaccination? V_{94} 100

5. Did you expect to get money because you participated in the vaccination campaign: V_{95} 101

6. Why did you not participate in the 2nd vaccination campaign? V_{96} 102

7. If there were another vaccination campaign would you like to participate? V_{97} 103

Why? V_{98} 104

8. After the researcher gave you the vaccine, what did you do with it? (to the vaccinators only) V_{99} 105

9. Where did you store it? V_{100} 106

10. For how many days did you store the vaccine before you used it? ☐ days/months V_{101} 107

11. How long did you give vaccine to people, after you had mixed it with the water/feed V_{102} 108

APPENDIX F

MAP OF STUDY AREA-DISANENG VILLAGE