Report on

Mid-Term Project Evaluation

"Phase 2 - Regional Newcastle Disease Control Project (Malawi, Mozambique, Tanzania and Zambia)"

Prepared for the KYEEMA Foundation by:

Pat Boland
Field Veterinary Officer, SSLPP

September 2011

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Acronyms

#m	# million (eg 2m = 2,000,000)
ACIAR	Australian Council for International Agricultural Research
ADD	Agricultural Development Division
AI	Avian influenza
AU-IBAR	African Union - Inter-African Bureau for Animal Resources
AusAID	Australian Agency for International Development
CCC	Country Coordinating Committee
CTTBD	Centre for Ticks and Tick Borne Diseases
CVL	Central Veterinary Laboratory
CVRI	Central Veterinary Research Institute
DCA	Animal Sciences Directorate (Direcção de Ciências Animais)
DNSV	National Directorate of Veterinary Services (Direcção Nacional dos Serviços Veterinários)
FIPS	Farm Input Promotions
I-2	Newcastle disease vaccine strain I-2
IIAM	Agricultural Research Institute of Mozambique (Instituto de Investigação Agrária de Moçambique)
MWK	Malawi Kwacha (= approximately USD 0.006751 in August 2011)
MZN	Mozambique new metical (= approximately USD 0.03759 in August 2011)
ND	Newcastle disease
NLRI	National Livestock Research Institute
PANVAC	Pan African Centre for Vaccine Production
PCC	Project Coordination Committee
SANDCP	Southern African Newcastle Disease Control Project
SDAE	District Service for Economic Activities (Serviço Distrital de Actividades Economicas)
SPP	Provincial Livestock Services (Serviços Provinciais de Pecuària)
SSLPP	Small Scale Livestock Promotion Program
TZS	Tanzania shilling (= approximately USD 0.0006365 in August 2011)
USD	United States dollars
VACNADA	Vaccines against Neglected Animal Diseases in Africa
VIC	Veterinary Investigation Centre
VPU	Vaccine production unit
ZMK	Zambian kwacha (= approximately USD 0.0002102 in August 2011)

Executive Summary

The project under evaluation works with the village chicken - arguably the most important livestock species for southern African smallholders. It seeks to control the most important source of loss in that species - Newcastle disease.

It is thus not surprising that in the entire livestock sector, there are few opportunities for as broad-scale an improvement of smallholder livelihoods as is presented by the ability to deliver an affordable, practical preventive measure against this disease.

This project is one small part of a wider matrix of development work over two decades to provide smallholder farmers with the wherewithal to protect their chickens against Newcastle disease. The project is doing a remarkably good job at this phase of the journey. It is working in the right direction at the right time in a manner consistent with the context of the story. It is doing so thanks to the dedication and hard work of a myriad of individuals, both within the project and in government services and communities in the target countries. At the relevant levels, the project has benefited from the vision of its designers and from the dedication, perseverance and practicality of those responsible for its execution.

The host of recommendations in this report should not divert attention from the fact that so many people have worked so hard to achieve so well. It is with a certain sense of trepidation that the writer makes so many recommendations which might give the impression that the project should be better managed. Not so. Let it be said from the outset, without ambiguity, that this project is being managed and executed very well, with a level of expertise and dedication that should be the envy of similar projects.

The recommendations arising out of this evaluation focus on the importance of motivation and education of communities so that the benefits of vaccination are well understood; the need for motivation and empowerment of community vaccinators; the need for sustainable financing, smooth functioning and quality control in vaccine production units; and the need to support the emergence of a demand driven system operating on a broad country-wide basis.

But to reiterate, we are talking about a journey here, a journey of which this project forms just one part. We should not lose sight of the historical context - the decades of scientific and logistical development which have gone into the isolation and reproduction of a suitable vaccine agent, the years of focussed work to test the practical and logistical implications for vaccine delivery - nor should we lose sight of the road ahead, the widespread access to vaccine and knowledge, and the translation of success from focussed target areas to whole countries.

Acknowledgements

In the conduct of this evaluation, I was once again part of a review team the composition of which varied from country to country. We visited institutions, government offices both central and district, and project sites to ascertain down to the grass roots level what were the outcomes from the first year of activities under Phase 2 of the project and to make observations and conclusions applicable to the remainder of this phase. I could not have succeeded in my part of the task without those valuable human values of support, guidance, tolerance, and leadership from a wide circle of colleagues and co-workers.

I would like to express my gratitude to staff of the following institutions:

- In Tanzania, the Central Veterinary Laboratory in Dar es Salaam, and the District Agricultural and Livestock Development Office in Singida;
- In Mozambique, the National Directorate of Veterinary Services (Direcção Nacional dos Serviços Veterinários) and the Animal Sciences Directorate (Direcção de Ciências Animais) in Maputo, and the Provincial Livestock Services office (Serviços Provinciais de Pecuària) in Gaza Province;
- In Zambia, the Central Veterinary Research Institute near Lusaka, and the Department of Veterinary and Livestock Development in Lusaka;
- In Malawi, the Department of Animal Health and Livestock Development and the Central Veterinary Laboratory in Lilongwe, the Blantyre Agricultural Development Division, the district agricultural offices in Mulanje, Thyolo, and Chiradzulu; the Small Scale Livestock Promotion Program (SSLPP) in Lilongwe and Inter-Aide in Nathenje.

Our work was only possible with the cooperation and help of communities and their village headmen at the many villages visited in Tanzania, Moçambique and Malawi. We are thankful for their input and feedback without which the review would not have been possible.

I would also like particularly to thank my colleagues who participated in and assisted in the evaluation:

Dr Judite Braga, Country Project Coordinator, Mozambique

Dr Rosa Costa, Regional Project Manager for Mozambique, Tanzania, Malawi and Zambia

Mr Richard Mgomezulu, Country Project Coordinator, Malawi

Dr Halifa Msami, Country Project Coordinator, Tanzania

Dr Namukolo Muyamwa, Country Project Coordinator, Zambia

Dr. Jan Wiesenmüller, Regional Manager, Kyeema Foundation, Mozambique

Dr Mary Young, Technical Manager, Kyeema Foundation, Brisbane, Australia

Dr Ana Zandamela, Veterinarian, Kyeema, Mozambique

Pat Boland

29 September 2011

Introduction

During the period July 2009 to June 2010, the Kyeema Foundation implemented the first phase of a Newcastle Disease Control Project entitled "Strengthening rural livelihoods and food security through improving village poultry production in Malawi, Mozambique, Tanzania, and Zambia". The agencies responsible for the project were the respective Departments of Animal Health and Livestock within the relevant government ministries. The overall aim of this project was to increase village poultry production in the project areas to contribute to poverty alleviation. The project was funded by the Australian Agency for International Development (AusAID).

A second phase of the project entitled the "Regional Newcastle disease control project (Malawi, Mozambique, Tanzania and Zambia)" began in July 2010 and is scheduled for completion in June 2012. This phase operates through the implementation of a community-based ND control program that works towards:

- Strengthening the capability of, and relationship between, stakeholders in order to successfully implement ND control programs; and
- Achieving a decrease in chicken mortality rates caused by ND in project areas.

The project has four components:

1. **Community ownership and partnership**: To develop effective and sustainable community participation and ownership of Newcastle disease control activities.
2. **Communication and extension**: To provide effective training, education and awareness-raising of relevant community members, community vaccinators, NGOs, extension and veterinary staff in relation to ND control, highly pathogenic avian influenza (HPAI) preparedness and poultry husbandry.
3. **Vaccine and vaccination**: To provide technical inputs required to support the ongoing development of an effective and sustainable ND control program in all participating countries and the establishment of local production and quality assurance of I-2 ND thermo-tolerant vaccine at the Central Veterinary Research Institute (CVRI) in Zambia.
4. **Effective project management**: To manage the project efficiently and effectively and in accordance with AusAID standards.

Background

There have been three distinct historical developments in the use of the I-2 vaccine in the project target countries.

During several years from the late 1990s, the Australian Centre for International Agriculture Research (ACIAR) supported the University of Queensland to undertake research on and development of the thermo-tolerant Newcastle disease vaccines NDV4-HR and I-2, for the control of Newcastle disease in village flocks. Much of the field work focussed on Mozambique. The I-2 master seed was developed with the aim of supporting the control of Newcastle disease in developing countries by making available a master-seed for a vaccine without cost to interested governments.

The second development occurred between 2002 and 2005, when the Australian Agency for International Development, AusAID, supported the "Southern African Newcastle Disease Control Project" (SANDCP). This project centred around a community-based Newcastle disease control program, with the aim of improving the livelihoods of poor villagers in Malawi, Mozambique and Tanzania by decreasing mortality in village chickens due to Newcastle disease. The project focused on an integrated program encompassing institutional strengthening of government livestock services and NGOs, and promoting rural community participation and ownership of the Newcastle disease control program.

SANDCP made significant achievements in awareness and sustainable control of Newcastle disease in village chickens as a result of the production, distribution and use of the thermo-tolerant I-2 vaccine in conjunction with training and education activities. KYEEMA Foundation continued the work done under SANDCP in Malawi, Mozambique and Tanzania, and expanded to include activities in Angola and Zambia.

Vaccine production and testing in Malawi, Mozambique and Tanzania was a significant part of the foundation for the successful and sustainable Newcastle disease control project and there were necessary follow-up activities that were regarded as imperative for sustainable vaccination campaigns, such as capacity building in quality assurance, timely and appropriate delivery of Newcastle disease vaccine, the development and use of extension materials, Newcastle disease control activities, improved rural poultry husbandry practices, and community development. Follow-up activities also included support with some additional laboratory equipment needed to improve the quality or increase the quantity of production of the I-2 vaccine.

These needs led to the third development which comprises the project under review. The project has been introduced in two separate phases, the first of which was of one year's duration, completed in June 2010. Phase 2, of two years' duration, began in July 2010 and the current evaluation covers the first year of activities.

Because Zambia was not part of SANDCP, the focus of the current project there is more on development of vaccine production capacity, field testing, and focussed vaccination programs in targeted areas with appropriate monitoring of progress.

Overview

Terms of reference and purpose of the evaluation

The purpose of this evaluation is *to assess the achievement to date of the project outcomes as detailed in the project document and the Project Implementation plan.*

In particular, the evaluation should:

- *Assess the extent to which the project is generating the intended outputs*
- *Assess the utilisation of resources allocated to the project;*
- *Identify major factors that have facilitated or impeded the progress of project implementation[1];*
- *Assess the coordination with, and support given to field personnel, both government and NGO, including provincial and district veterinary staff and extension officers;*
- *Assess the support given to community vaccinators from village leaders, project personnel, district veterinary staff and supervisors, the payment they receive and their 'job satisfaction'; and*
- *Advise possible strategies to overcome identified problems in attaining project outputs.*

Reporting

The final version of the report in English should be submitted to KYEEMA Foundation within two weeks of the end of the input, before 15 August 2011.

Evaluation Team

The evaluation was undertaken during the period 28 June to 30 July 2011, by a team comprised as follows:

	Country			
Team member	**TZ**	**MZ**	**ZA**	**MW**
Dr Rosa Costa, Project Regional Coordinator	X	X	X	
Dr Jan Wiesenmüller, Regional Manager Southern Africa				X
Dr Pat Boland, Field Veterinary Officer, SSLPP: - Consultant	X	X	X	X
Dr Halifa Msami, Country Project Coordinator, Tanzania	X			
Dr Judite Braga, Country Project Coordinator, Mozambique		X		
Dr Ana Zandamela, Veterinarian, Kyeema, Mozambique		X		
Dr Namukolo Muyamwa, Country Project Coordinator, Zambia			X	
Mr Richard Mgomezulu, Country Project Coordinator, Malawi				X

1 For the purposes of reporting, the writer has altered the order of the terms of reference so that factors that have facilitated or impeded progress is the penultimate topic.

Approach

The project coordination meeting in Dar es Salaam on 28-29 June 2011 provided a valuable opportunity to exchange ideas and information relating to the review. This meeting was attended by the writer prior to the field visits and discussions with relevant project related personnel.

During the period of the evaluation, the team met with many of the key stakeholders who have a part in the control of Newcastle disease in village poultry in the four countries under review. These stakeholders included government and non-government institutions as well as community vaccinators and individual villagers in the target areas for the project.

The list of people, institutions and places visited included:

- Tanzania:
  - Office of the Director, CVL, Dar es Salaam (Dr Sachin Das)
  - Office of the head of the Vaccine Production Unit, Dar es Salaam (Dr Gabriel Shirima)
  - Office of the District Agricultural and Livestock Development Officer, Singida (Mr Joseph Msafiri)
  - Mughanga village, Singida District
  - Mwakiti village, Singida District
  - Msungua village, Singida District
  - Unyangwe village, Singida District
  - Nkunikana village, Singida District
  - The I-2 VPU at Central Veterinary Laboratory, Dar es Salaam
- Mozambique:
  - Office of the Deputy Director of DNSV (Dr José Libombo Junior)
  - Office of the Director of the DCA (Dr Paula Dias)
  - Office of the Head of Provincial Livestock Services, Gaza Province (Dr Constantino Banze)
  - Chibuto district, Gaza Province
  - Chigubo district, Gaza Province
  - Massingir district, Gaza Province
- Zambia:
  - Office of the Director CVRI, Lusaka (Dr Paul Fandamu)
  - The office of the Director of Veterinary and Livestock Development (Dr Joseph Mubanga)
  - Office of Prof Kenny Samui, University of Zambia
  - Central Veterinary Research Institute, Lusaka
- Malawi:
  - The I-2 VPU at Central Veterinary Laboratory, Lilongwe
  - Blantyre ADD head office
  - Thyolo District agricultural office, Nkhonjeni EPA, Maganiza and Ndalama villages
  - Mulanje District agricultural office, Msikawanjala EPA, Kabuthu and Kampala villages
  - Chiradzulu District agricultural office, Mbulumbuzi EPA, Chilemba and Msomera villages
  - Lilongwe Agricultural Development Division

- The Small Scale Livestock Promotion Program (SSLPP)
- Inter-Aide Malawi
- The Lilongwe Society for the Protection and Care of Animals

The review team regularly discussed issues of concern and refined its approach to ensure that its observations became a reliable and usable tool for evaluation of the project. A list of questions and topics discussed with target communities and community vaccinators is attached in the appendix on page 53. The nature of questions and discussion topics at the various offices were many and varied.

Country profiles

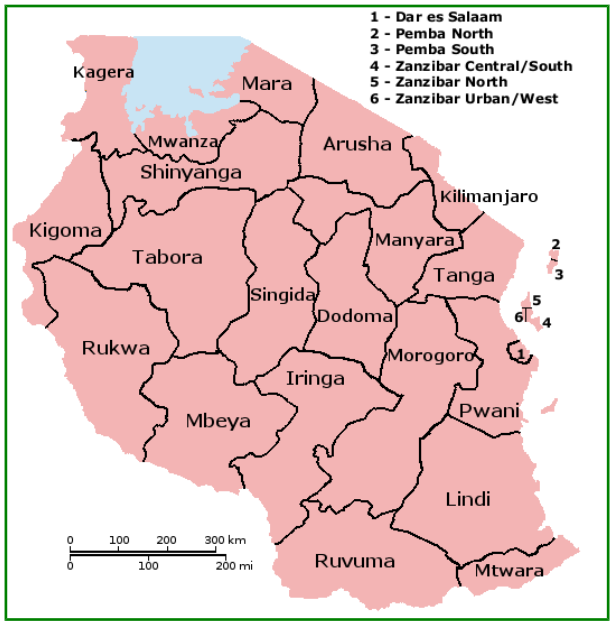
Before addressing the terms of reference for this review, it is necessary to outline the varying profiles of each target country with regard to the historical and logistical parameters which impinge upon progress and achievements under the project.

Every country involved in the project has its own characteristics in terms of such things as human population density, chicken population density, the previous history of Newcastle disease vaccination, logistical constraints, and so on. For this reason, it has been necessary to discuss the main findings below separately for each country.

Another significant point in this context is that what is meant by a "village" is not the same in all countries. In some countries such as Malawi, a village is a small unit typically of some 200-1000 households with its land holdings within a few kilometres. In others such as Tanzania, a village has a similar number of households but covers a much larger area. It is often divided into several sub-villages. In Mozambique, in a village (at least those subject to baseline studies) the number of households is smaller but the area is again very large. The review learned of several instances in Mozambique where community vaccinators were located as far as 100 km from the nearest point where vaccine was stored for distribution.

A few pertinent background facts about the four project countries follow.

Tanzania



Basic data:

Land area	885,800 sq km
Length x breadth (max)	1200 km NS x 1160 km EW
Population	42,746,620 (2011 est.)
Number of rural households	5,470,000 (2002 est.)
Estimated population of village chickens	Approx 35m (2010 est.)

Tanzania has 26 districts each of which is subdivided into divisions and wards.

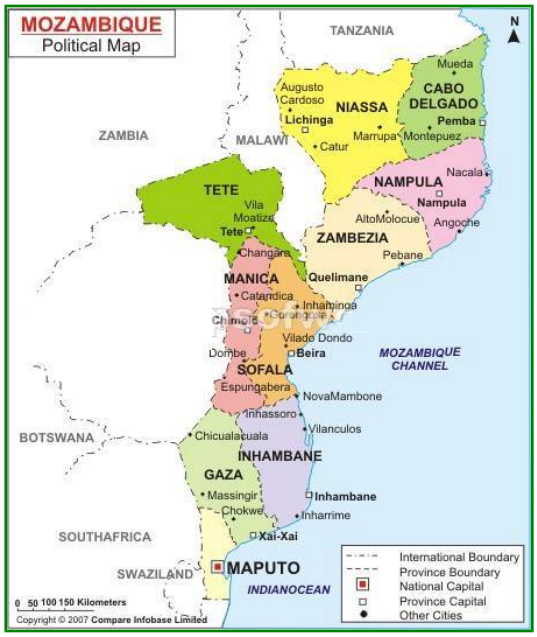
The physical environment in Tanzania is characterised by long distances and a climate which varies considerably in different areas of the country. As in all four project countries, chicken raising is an important feature of rural livelihoods throughout the country - in the project target area, Singida district, it is a mainstay. Singida is one of the driest districts in Tanzania and hence the rural communities there place relatively less emphasis on crops and more on animals for their livelihoods, as compared to other districts. In the words of the November 2010 mission in Tanzania[9]:

> *The high percentage of households keeping chickens, the large size of the flock (between 15 and 17 birds), and the dynamic poultry trade makes Singida the number one region in the country in terms of village poultry trading. In this very poor region village chicken raising is a business and an important livelihood strategy which is encouraged by political leadership. This unique situation explains the very high adoption of Newcastle disease prevention.*

Distances are a dominant consideration in the logistics of vaccination of village chickens. At present, the government takes a leading role in distributing vaccine from Dar es Salaam where it is produced, to district offices and to distribution points within the district. Even then, the distances to those distribution points is beyond the reach of community vaccinators and the government extension personnel play an essential role in getting vaccine to the vaccinators.

Historically, Tanzania has been actively supporting vaccination of village chickens for a long time. The use of the I-2 vaccine, first introduced in 2001, has increased steadily and significantly since 2006 from about 7m to about 37m doses per year[1]. This relatively long history of use may be a significant factor in the very wide use of I-2 throughout Tanzania nowadays.

Mozambique



Basic data:

Land area	786,380 sq km
Length x breadth (max)	1,820 km NS x 1150 km EW
Population	22,948,858 (2011 est.)
Number of rural households	3,185,000 (2004 est.)
Estimated population of village chickens	23,300,000 (2010 est.)

The physical environment in Mozambique is again characterised by long distances and a climate which varies considerably in different areas of the country. In Mozambique the project target villages are all within the Gaza Province. The environment there is dry in parts and the area remote.

Distance is again a significant consideration in the logistics of vaccination of village chickens. This is a significant impediment with no obvious solution. The population density of chickens is simply very low in comparison to other countries. The situation is characterised by dependence of community vaccinators on government services for transport and distribution of vaccine from the vaccine production unit in Maputo through provincial and district offices.

The same point was observed in the report by Carlos Cuinhane on the February 2011 PRA in Massingir, Mozambique[2]:

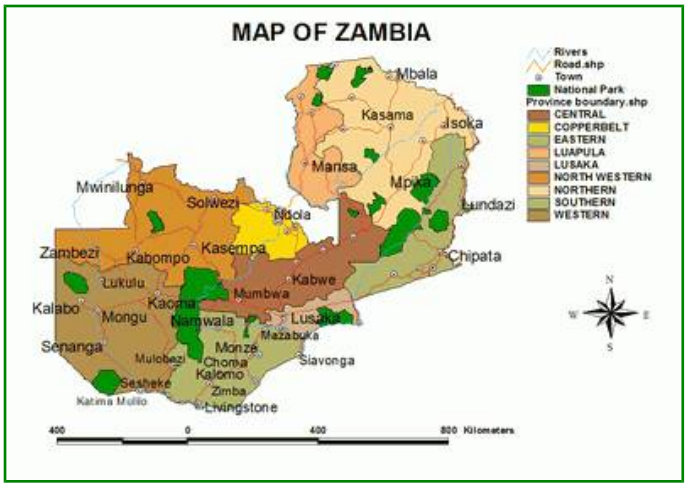
> *Many vaccinators complained that they were not able to cover all the households in their community because it is far from one village[2] to another.*

Distance was also a consideration for the review. In the villages visited in Mozambique, most of the community members present were community vaccinators and a lesser number were community leaders. The distances were such that convening a larger number of ordinary chicken owners was not possible.

Mozambique has been producing I-2 Newcastle disease vaccine since 1999. Vaccination in five provinces was begun under SANDCP.

2 This refers to the fact that households and communities were widely scattered within the area covered by one vaccinator.

Zambia



Basic data:

Land area	743,398 sq km
Length x breadth (max)	730 km NS x 870 km EW
Population	13,881,336 (2011 est.)
Number of rural households	1,170,781 (2000 est.)
Estimated population of village chickens	14,000,000 (2011 est.)

The history of I-2 vaccination in Zambia is only just beginning. Zambia was not part of the Southern African Newcastle Disease Control Project (SANDCP) and has not yet started field use of the I-2 vaccine. For this reason, the current review reports on the production facility, government participation, and plans for future activities.

Although desirable, it was not possible for the review team to visit the project target village locations in Zambia. Therefore this review draws its observations and conclusions about community involvement from the March 2011 Mission Report in Zambia by Brigitte Bagnol.[3]

Zambia does not have a history of use of I-2 vaccine. The use of La Sota and other Newcastle disease vaccines in the past has been largely confined to the commercial sector. However, there have been studies using NDV4-HR in the past. Prof Kenny Samui undertook vaccination trials in village chickens in 2008-2009 as part of projects supporting HIV/AIDS groups in Western Province and Southern Province. The Kyeema Foundation also implemented a project bordering on the South Luangwa National Park, focussing on sustainable control of Newcastle disease through vaccination and improved poultry husbandry and marketing.

Malawi

Basic data:

Land area	94,080 sq km
Length x breadth (max)	840 km NS x 340 km EW
Population	15,879,252 (2011 est.)
Number of rural households	2,600,000 (2007 est.)
Estimated population of village chickens	21,700,000 (2010 est.)

Malawi, like Zambia, is a land-locked country. It has a high human population density, about 100 persons per sq km of land area, with about 90% of the population living in rural areas dependant on agriculture. As elsewhere, village chickens play a very important role in the livelihoods of rural communities.

Most Newcastle disease vaccination in Malawi prior to the mid 1990s was confined mostly to the commercial sector. Malawi had a brief history of use of V4 Newcastle disease vaccine but this never became widespread. Malawi established its vaccine production unit during SANDCP and has steadily increased its production of I-2 vaccine in response to growing demand.

Findings

TOR 1: Project outputs

Assess the extent to which the project is generating the intended outputs

Component 1: Community ownership and partnership

The purpose of this component is to develop effective and sustainable community participation and ownership of a Newcastle disease control program.

The project document listed the following outputs under this component:

- Output 1.1: Conduct baseline survey, PRAs and gender analysis
- Output 1.2: ND control coordination activities
- Output 1.3: Improving awareness through education

The project capably undertook targeted studies or 'missions' in each of the target countries. The baseline information and data so gathered not only guided the future conduct of the project but provided invaluable background information for use in assessing progress and identifying strategies for correcting deficiencies. Without going into detail, this review has relied to a significant extent on the information derived from the monitoring data and mission reports which have been conducted in each country. No significant gaps were found in the breadth of information available.

The project played an essential role in coordination of vaccination activities in the target areas. There is probably scope for expanding that role in the context of areas which are outside the specified project areas but where vaccination can and should be expanded and/or improved. This, together with other aspect of coordination of Newcastle disease control, is discussed further below.

In terms of awareness and education, the project has available a wealth of materials mainly through the Kyeema Foundation, aimed at people of all levels, from technical experts, to trainers of trainers, to community vaccinators, to farmers themselves. Much of this material has been translated into the appropriate local language as required. There is scope for improved access to this material for prospective users who are not directly associated with the project.

Other materials of significant value for awareness-raising within the project include T-shirts and caps. In the light of discussions with communities and their vaccinators, the review team concluded that such items were not just a sweetener for vaccinators but were of significant value in promoting community confidence in vaccinators and better vaccination programs.

Community participation

The review team visited project target communities in all countries except Zambia. The general nature of questions and subjects covered in these meetings is shown in the appendix on page 53.

It should be pointed out that these meetings were necessarily brief and did not entail structured interviews and detailed examinations built into other project studies by social anthropologists. It is likely that some responses were given more in the hope of satisfying or placating team members rather than realistically portraying pessimistic or otherwise awkward information.

That said, people in villages visited by the team consistently felt that chickens were their most important livestock species. Reasons cited stood to reason and included:

- Their small size which made them an easily manageable economic unit, a unit the loss of which was not too harmful, a unit where decisions about sale might be made without requiring reference to the household head;
- Their high [potential] reproductive rate;
- The ease with which they could be raised;
- Their scavenging ability which reduced the need for manual feeding.

Villagers had an excellent appreciation of the importance of Newcastle disease and the effectiveness of vaccination with the I-2 vaccine in preventing losses. They repeatedly cited increased chicken numbers as a benefit of vaccination under the project. When pressed for details, the following points emerged:

- The numbers of chickens owned by villagers had increased significantly since the inception of the project. The team heard many examples of people who had owned just 1-3 village chickens before the project had started, increasing their flock to 15-30 chickens after Newcastle disease had been controlled. Occasionally, people now owned village chickens numbering in the hundreds. (The main reason why this was only "occasional" was the limitations in housing as explained on page 43 below).
- There was lower overall mortality amongst chickens due to lower incidence of Newcastle disease. This contributed to increased numbers of chickens and increased opportunity for sale, exchange or consumption of chickens.

The above points applied across the board, with no substantial differences between villages visited in Tanzania, Mozambique and Malawi.

In some villages, there had been historic use of La Sota vaccine to control Newcastle disease before the advent of vaccination with I-2. These communities recognised a higher level of effectiveness of I-2 in protecting their chickens compared to La Sota, with a correspondingly higher acceptance of its use. The reasons for poorer efficacy of La Sota is a matter of conjecture but may have been due to poor maintenance of the cold chain.

Villagers also appreciated the economic benefits of control of Newcastle disease. There was a widespread consensus that control of the disease was associated with increased income from chicken sales.

Especially at villages in Singida District, Tanzania, there was more stability in the price received for chickens. In this area, Newcastle disease was strongly seasonal. Prior to the project, the months before the onset of Newcastle disease outbreaks were characterised by pressured and haphazard selling of chickens with consequent saturation of demand and depression of prices received. By contrast, now that Newcastle disease has been successfully controlled, selling is less forced, takes place at any time during the year, and can easily be deferred if market prices are temporarily low.

Given such a profound positive outcome from the successful initiation of Newcastle disease vaccination, it is not surprising that communities were exceptionally receptive to the project. They were optimistic about continuing in their use of the I-2 vaccine and hoped to gain further benefits through its use. They were often concerned about the possible disruption to vaccination which they thought might occur when the project ended (even though these concerns were probably ill-founded).

In Zambia, it can reasonably be anticipated that there will be a similar community response when vaccination campaigns take place. The PRA undertaken in March 2001 by Brigitte Bagnol[3] indicated that although cattle were rated as the most important species for their value for traction, chickens were the most important in terms of meat consumption or sale/exchange. In the villages studied, Newcastle disease was recognised as the main threat to chicken productivity (despite some discrepancies in villagers' ability to recognise the disease).

In all countries, communities expressed concern over chicken losses or diseases other than Newcastle disease which had emerged now that Newcastle disease had been controlled. This was a very significant issue which is discussed in some detail on page 24 below.

Leadership within communities

The structure of local leadership and the nature of the relations between local leaders and the local political and administrative structure varies somewhat from country to country. However in all project countries, the ability of rural communities to organise and sustain an environment where small scale vaccination of chickens can continue, depends heavily on the understanding and support of local leaders and traditional authorities.

The team observed that the level of understanding and support varies somewhat from village to village. In general, communities indicated that they received good support from their village head. The village head generally understood the reasons for the vaccination program and gave moral support to their communities, but some were notably better at this than others.

There has been an increasing trend towards including local leaders in training sessions for community vaccinators and sensitisation meetings associated with the vaccination campaigns even though those leaders will not actually vaccinate chickens. This is a welcome development because better informed leaders are more effective in motivating and influencing their community members. The concept should be recognised as a highly desirable element in other areas where the vaccine might be introduced. The January 2011 mission in Malawi by Brigitte Bagnol[4] recommended that "Leaders and committee members should only receive a half day of training on ND and organization of vaccination campaigns." The writer suggests that at least the leader of each village should be encouraged to attend the full training course for community vaccinators, not just part, but that they should not routinely participate as vaccinators within their village. The extra effort and cost of this is considered to be worthwhile through ensuring that village leadership is better equipped to promote vaccination through a better understanding of the whole process. This suggestion is notably consistent with the practice in Tanzania where vaccination coverage is demonstrably better than in other countries. At PCC2 in June 2011, the District Agricultural and Livestock Development Officer for Singida, Mr A Y Sengo, made following point with regard to training of community vaccinators[5]:

> *The project right from the beginning involved village leaders in every stage of the project. Village chairpersons and village executive officer are also part of community vaccinators*

Coordination

There have been effective measures to ensure coordination both regionally and nationally. At a regional level, there were Project Coordination Committee meetings for Phase 1 in Mozambique in December 2009, and in Zambia in June 2010. In relation to Phase 2, there have been two PCC meetings, one in Malawi in December 2010, and one in Tanzania in June 2011.

At a national level, there have been Country Coordination Committee and/or stakeholder meetings as follows:

- Tanzania: August 2010, December 2010, and May 2011
- Mozambique: October 2010 and June 2011
- Malawi: September 2010, April 2011, and June 2011
- Zambia: June 2011.

These methods of coordination at both regional and national levels appear to have been very effective. Within countries, the government and project staff have been kept up to date on developments including those outside of their immediate area of responsibility. Similarly, the exchanges seen through PCC meetings have been beneficial in sharing information and ideas between countries, a significant fact given the disparities that exist between them in terms of uptake of Newcastle disease vaccination by their rural communities.

In addition to the above coordination meetings, the Maputo-based Project Manager receives monthly progress reports from each of the Country Project Coordinators. Although it was reported at the PCC2 that provision of these reports have been irregular, this does not appear to have impacted significantly on the overall progress of activities. The irregularity should nonetheless be corrected in order to ensure timely reporting.

An important aspect of coordination in every country involves engagement with non-project institutions which have an interest and/or involvement in control of Newcastle disease in village chickens. Sometimes this interest might appear indirect but may still have much potential for exploitation. The range of such institutions is many and varied and project coordinators should strive to identify and engage with as many of such institutions as possible. Some current examples where there have been contact and coordination with potential partners include:

- in Tanzania: Research into Use (RIU) Tanzania, an institution supporting commercialisation of village chickens; FIPS Nairobi; the Open University of Tanzania; the Sokoine University of Agriculture; NLRI Mpwapwa; VIC Mpwapwa; District Agricultural Development Initiative Programmes (DADIPs)[1]
- in Mozambique: the Institute for Management of Calamities; Save the Children Foundation; Corridor Sands Limited (CSL, a local mining company); the Provincial Extension Services (SPER); the Animal Science Research Institute of Mozambique (IIAM)[6]
- in Malawi: the Small Scale Livestock Promotion Program (SSLPP, a local NGO); Inter-Aide Malawi (an international NGO); the Lilongwe Society for the Protection and Care of Animals (LSPCA); GSJ (a local veterinary supplier)[7].

Coordination with agencies such as the above can be beneficial and should be encouraged because they may play a significant role in expanded use of the vaccine.

Community vaccinators

In the chain of components necessary for a successful, sustainable Newcastle disease control program, the importance of community vaccinators cannot be over-emphasised. These people comprise a critical element in "economic sustainability based on the commercialisation of the vaccine and vaccination services" which was advocated in the Phase 2 - Regional Newcastle Disease Control Project project document.[8] We will discuss community vaccinators in more detail under TOR 4 on page 36 below.

The team met with community vaccinators at many of the villages it visited. In some cases indeed, community members interviewed consisted solely of the community vaccinators. The use of community vaccinators is an effective means of ensuring a sense of ownership and control on the part of rural communities. Because they are based within the communities, they give a strong sense of ownership to other community members. The team found that the community vaccinators were generally well motivated and interacted well with the communities within which they worked. In general they were also an excellent partner for project and government extension staff through their roles in publicity, vaccination, monitoring and reporting. Of course, these comments cannot yet be applied in the case of Zambia, but there is every hope that community vaccinators there will play an equivalent important role there once they are established..

Component 2: Communication and education

Communication and education are a critical element to the successful establishment of a vaccination program for village chickens. Both require to be addressed at several levels: at the level of national and regional stakeholders, down to the level of individual community members, and at the many levels in between.

Communication within the project has been generally good. There has been good communication with respect to the project's broad objectives and activities. Within the line of command/communication from departmental headquarters through the divisional and/or district offices, to extension staff responsible for the project areas, there is a good general understanding of the project as well as a strong sense of support for the objectives. Equally, there is clearly good communication between government and project extension staff and community vaccinators who appeared to be fully aware of all the information they required to do their job.

Output 2.1: Extension materials

The review found that the extension materials produced under the project were appropriate for the purpose. The nature and quality of the materials was excellent. Where appropriate, materials had been translated into the local language.

However, there appeared to be a significant disparity between countries in meeting the demand for extension materials especially at the level of chicken owners. In Tanzania, communities visited had received a significant amount of extension materials in the form of calendars and posters in comparison to elsewhere. These same communities however, expressed the view that they had not received enough copies, especially of vaccination calendars. In other countries, notably Malawi, there had been sufficient copies of calendars to satisfy the requirements of village leaders and community vaccinators, not users.

It would seem that the quantity and distribution of extension materials in the different countries should be reviewed and targets set in terms of distribution to extension staff, village leaders, community vaccinators and users. One idea put forward was that each vaccinator might be given say 10 extra copies of vaccination calendars which they could distribute as a small incentive to the most successful and cooperative of their client farmers. The merits of this idea could be discussed by the appropriate people at a local level.

Zambia stands apart on this topic of extension materials because field use of the vaccine has not yet started there. However, the training and extension activities there will undoubtedly be of paramount importance as they have been elsewhere. The extension materials in Zambia have yet to be produced. This is an important step which clearly will soon become a pressing issue as the stage of field use of the vaccine approaches. Adaptation and translation of the materials already available through the Kyeema Foundation will be required in order to produce suitable materials for the Zambian context.

Output 2.2: Training and extension activities for ND control

The review team consistently found that the key players were adequately trained and informed about vaccination with I-2. Government staff, from senior professionals through technical staff to extension officers, were generally well informed and had the wherewithal to carry out their respective responsibilities. Likewise, community vaccinators were generally well trained, motivated and capable in their roles.

The typical training for community vaccinators requires 2.5-3 days. Although much of this training had already been completed during Phase 1, some further training took place during Phase 2. Thus, Malawi has expanded its project focus area to include 28 new villages with associated training for 56 vaccinators (one man and one woman from each village)[7].

The writer endorses a recommendation which has been made in baseline/PRA mission reports in both Tanzania[9] and Malawi[3] that flip charts on Newcastle disease should be used by vaccinators in educating farmers. This has already been done in Mozambique where, in the August 2010 mission report[10], Brigitte Bagnol noted:

> *The use of the flip-chart to disseminate information on the characteristics of ND was verified with the vaccinators and the community. It is apparent that vaccinators use it during the meetings held with the farmers, however, some of the vaccinators need more practice in its use.*

The implied point about not only providing the flip-chart but giving vaccinators guidance in its use should not be overlooked. The flip-charts in question have been in existence since the time of SANDCP and are available in English, Kiswahili and Chichewa.

While the extension materials are very good and those messages are conveyed to the appropriate people, there seems to be a need for increased emphasis on educating rural people about the commercial nature of their enterprise. The widespread lack of such an appreciation should not be surprising - most village chicken owners have never spent any actual money on their birds - but it is something which might be worthy of more attention. In many cases during the review, it became evident that chicken owners did not recognise or did not want to recognise the value of investing in their birds. This was significantly less so in Tanzania where rural communities appeared very well informed and proactive and there was a significantly broader grass-roots

support for vaccination (as will be described in more detail below). The Tanzania observation lends weight to the notion that there is no insurmountable impediment to guiding rural communities towards a more commercial outlook for village chicken production.

In the end-of-project review for Phase 1 in Malawi[11], the writer made the following point:

> *Rural smallholders are disinclined to view village chicken production as something which should be analysed in financial terms. It is yet another step for them to understand the economic realities of vaccination against Newcastle disease ... owners could easily be brought to conclude that an investment of K10 to protect a chicken worth K300-800 represented value for money but only when 'cornered' on the question.*

The January 2010 baseline study in Malawi[12] reported by D.C. van den Ende came to a similar conclusion:

> *The villagers need to be informed on the symptoms of Newcastle Disease and symptoms of other diseases to prevent thinking the vaccination was not successful when chickens die due to other diseases. A structured cost-benefits analysis must be shown to the villagers to convince them to invest in vaccinating their chickens.*

Although most communities interviewed no longer regard the cost of vaccination as too high, there is a continuing need to impress on them the idea that the risk of Newcastle disease is a far greater threat than the cost of vaccine. In the March 2011 baseline mission in Zambia, where vaccination campaigns had not yet started, it was reported that farmers at first questioned the need to pay for vaccination. Although this matter was resolved at the time of the study, extension activities in that area should pro-actively address this matter in order to pre-empt disruption or confusion to the vaccination program.

Output 2.3: Capacity building of Ministry staff and skills exchange

The project organised for attendance by key scientists with responsibility for vaccine production and quality assurance to attend an "OIE Veterinary Biologics Training Program" in Iowa, USA. Candidates from Tanzania, Mozambique and Zambia attended. A learning agreement and an action plan were completed by each candidate.

In addition, the project has arranged for one selected candidate from each of the project countries to attend a "Training Course on Laboratory Quality and Biosafety and ND diagnosis" in August 2011 at the Istituto Zooprofilattico Sperimentale delle Venezie, Italy. This institution is an OIE, FAO, and National Reference Laboratory for Newcastle Disease and Avian Influenza.

The project also arranged for skills exchange through a visit by a senior technician from Malawi, Mr Precious Dzimbiri, to visit Lusaka to assist in vaccine laboratory trials. This visit was much appreciated by the technical staff in Zambia.

An activity originally proposed in the project document, to place Australian volunteers in Malawi under the Australian Volunteers International program, has been overtaken by events and is not likely to be feasible during the remainder of the project period. This is not a significant omission in terms of the overall program and direction of the project. The concept might be applicable after the end of Phase 2 but it would not be appropriate to attempt to fit it within the current period.

Component 3: Vaccine and vaccination

The purpose of Component 3 "Vaccine and vaccination" is to provide the technical inputs and support capacity building required to support the development of an effective and sustainable Newcastle disease control program for village chickens.

Overall, the project has very capably followed up on the progress made under SANDCP and Phase 1 in creating and maintaining the conditions necessary for production and distribution of I-2 vaccine. This alone should be recognised as a very significant achievement, notwithstanding the fact that it is but one step in a long

chain from the production facility to the end user. Project staff are rightly concerned to ensure that the quality of vaccine and the security of the cold chain are fully adequate.

Output 3.1 Improved capacity and trained laboratory staff

All project countries now have in place laboratory staff whose competencies are appropriate and adequate for the work they are doing. Where appropriate, training or exchange visits have taken place to ensure that laboratory staff have adequate skills. In Zambia, where I-2 vaccine production is only just beginning, the above mentioned exchange visit from a senior technical officer from Malawi provided a means of strengthening the skills of local laboratory staff.

One area of concern to the project has been the potential loss of people who have been trained in vaccine production, through promotion to other areas or through secondment for further training. Whilst there have been some case in point, there does not appear to have been any significant disruption to vaccine production programs as a result. There have been adequate staff on hand to carry on. Nonetheless the concern is justified. It was echoed in the December 2010 audit report on I-2 production in Tanzania and Moçambique compiled by Dr Shafqat Fatima Rehmani[13]:

> *Substitute staff member should be arranged prior to allowing a technical person to proceed on study/long leave or earned leave.*

There are competing interests here. On the one hand, employees should in principle be given every reasonable opportunity to further their careers. On the other, the 'investment' in training specifically designed to assure continued production of vaccine should not be jeopardised through precipitate departure of recently trained technical experts. 'Learning agreements' which have been required for the training at Iowa and Italy are a good idea but they have only very partially addressed this issue. A possible solution might be some form of formal signed agreement between all parties before training is started. Such an arrangement should not only involve the employee and the project but also the employee's administrative supervisors, ie those whose approval of leave is required. The agreement would include conditions applying to voluntary departure from the work place within a specified period after training.

Output 3.2 Laboratories and vaccine production, storage and distribution

The situation with regard to vaccine production units varies significantly from country to country and in two cases it is in a state of flux. Overall, the facilities as they exist are capable of satisfying demand for now and for at least the short term future. Each vaccine production unit has adopted its own approach to dilution of allantoic fluid for vaccine production. This has important implications for efficacy, production costs, and production capacity. The question of dilution rates has been discussed in appropriate technical forums and should continue to be discussed in the light of relevant scientific studies.

In Tanzania, the current vaccine production unit is located at the premises of the central veterinary diagnostic laboratory in Dar es Salaam. There are six technical staff for the unit. The production unit also produces four different vaccines for cattle. The diagnostic laboratory is situated in separate buildings on the same premises.

There are imminent plans to relocate the entire vaccine production unit to Kibaha, about 20 km from the centre of Dar es Salaam. This will have the advantage of separating the production unit further from the diagnostic laboratory but more staff will be required in the new location because a multidisciplinary team is required there. The move reflects a very high level of commitment on the part of the Tanzanian government to the production and use of vaccines including I-2.

Limited staff numbers was said to be one of the main problems facing the Tanzanian vaccine production unit at present. Of the 10 staff previously working in the unit, four have gone for further studies, leaving six to man the unit. During peak production periods, there is a very heavy workload for the production team.

Unreliable power supply has been another problem facing the unit. There is a fixed back-up generator but problems with this meant that another mobile generator had to be brought in.

A significant strength in the organisation of the VPU in Tanzania was the fact that there was a separate marketing/distribution unit for the vaccine. This unit was about 3 months old at the time of review. Production staff were now less hampered by operational issues to do with distribution or complaints from clients. The marketing team was more focussed on getting the finished product to the user. The model is a good idea, especially from the perspective of assisting in distribution and marketing of vaccine outside the 'traditional' channels. It is suggested that the Project Coordinator for Tanzania arrange to make a presentation at the next PCC meeting (or other suitable forum) so that other countries can better understand the function and operation of this unit.

The VPU in Tanzania had also created a separate procurement unit to focus on acquisition of materials and other necessities for the production unit.

Since it was the largest producer of I-2, the Tanzanian VPU had found it possible to dedicate separate staff to the marketing/distribution unit. While this is not necessarily feasible in the other project countries with smaller staff numbers, the notion of separating and defining the functions of vaccine marketing and distribution is one which should be adopted elsewhere. During the 2010 audit of the vaccine production unit in Malawi[14], Dr Mary Young made a recommendation which was consistent with the concept of a distinct functional marketing/distribution unit. She recommended the establishment of:

> *An Administrative/Accounts Assistant located at CVL to assist with taking vaccine orders, packing vaccine, collecting and reconciling funds from vaccine sales and diagnostic testing.*

Each production unit can and should define its marketing and distribution strategies and procedures with a view to ensuring widespread access to the vaccine and to information on its proper use.

In Mozambique, the vaccine production unit is situated at the Agricultural Research Institute of Mozambique (Instituto de Investigação Agrária de Moçambique - IIAM).

IIAM Maputo

The unit is capable of producing about 8m doses of I-2 each year. It uses eggs produced from its own flock of about 250 hens. The hens have a specified vaccination schedule. The production unit is well separated from diagnostic areas.


IIAM main entrance

The unit has received good support both from government and from other sources. Government support has enabled the purchase of an incubator, a refrigerator, a centrifuge, and a water purification unit. Through support from the VACNADA project, the unit is in the process of acquiring a freeze drier unit.

Problems encountered by the unit included ensuring an adequate supply of good quality feed for the chicken layer flock, inability to find local expertise for maintenance or repair of the autoclave, the repetitive and labour-intensive nature of much of the work leading to staff boredom, and the need for a quality control manager for the VPU. These are on-going problems which affect not only I-2 production but also other programs.

In Zambia, the government has recently renovated existing buildings which now house the vaccine production unit at the Central Veterinary Research Institute 19 km outside Lusaka. This is a very welcome move. There is ample space at the new facility but fitting out the buildings will take more time. The move reflects valuable commitment towards improving diagnostic and other laboratory work for livestock on the part of the government.


CVRI Zambia


Egg inoculation at CVRI, Zambia

The unit has started pilot scale production of I-2 vaccine and will shortly begin field trials. Eggs are sourced from a local commercial supplier (Ross Breeders).

The facilities at the vaccine production unit have enabled it to produce 14,000 doses of I-2 in anticipation of a field trial. A power outage had caused a malfunction in the -80°C freezer but that shortcoming is not an immediate threat to vaccine production.

Following a workshop in April 2010, equipment had been ordered or procured for the production unit. This included a vortex mixer, centrifuge, adapter cable, refrigerator, spatula, and automatic syringe. Not all of this equipment had arrived on site. The procurement of this equipment, which is being coordinated by local CVRI staff, should be followed up by the Kyeema Foundation Technical Manager.

There were seven staff trained in vaccine production at CVRI. Two of these staff are now working or studying elsewhere. Three others are members of other sections of CVRI so that only two of the workshop participants are now assigned full-time to the VPU. In addition, a veterinary graduate was due to start working in the vaccine production unit at the time of the review. VPU staff felt there was a need for further training on topics including HI and quality control. Staff at the unit had benefited from the visit by a senior technical officer in Malawi, Mr Precious Dzimbiri, who had visited to assist with laboratory trials.

A field trial on I-2 vaccination planned for July 2011 in Chongwe district had to be postponed due to inadequate time for preparatory activities. This trial is now likely to take place in November 2011. The review team felt that there was a need for clearer understanding and appreciation of the steps necessary to plan and execute such a field trial and the time and resources required for such steps.

There are plans to undertake a study on the cost of production of the I-2 vaccine at CVRI. In the light of project experience in analysing the cost of production in other countries, staff at the unit will use a similar approach for this study. VPU staff will need to look at the techniques used elsewhere in order to appreciate the complexities of this task.

CVL - Lilongwe

In Malawi, the vaccine production unit is located at the Central Veterinary Laboratory in Lilongwe. The unit consists of two rooms, one quite small, plus a small office for the senior technical officer. The unit is housed within a building which includes not only facilities for diagnostic work but also post mortem examination. The location is thus quite unsuitable for a vaccine production unit.


CVL main building which houses the vaccine production unit and other diagnostic and post-mortem rooms

The Department of Animal Health and Livestock Development which is responsible for the Central Veterinary Laboratory does not have any plans to relocate the unit. A suggestion which arouse out of the Phase 1 review in July 2010, that the facility be relocated to a separate unit previously occupied by a tsetse fly research group, was abandoned in favour of an alternative use for that space. It is regrettable that there does not seem to be any effort to resolve this important failing. The new egg incubator which was purchased by SSLPP and delivered in August 2010 cannot fit into the unit and has to be housed in a separate room. The significance of the shortcoming may have escaped the attention of senior management in the Department of Animal Health and Livestock Development. The project should explore means of addressing this shortcoming and liaise as appropriate with the various stakeholders.

The vaccine production unit has three full-time staff and is supported by the laboratory's quality control manager and the Country Project Coordinator.

The Malawi vaccine production unit uses eggs produced from its own dedicated chicken flock of about 150 birds. The grandparent stock for these birds originally came from South Africa with certification that they were free from Salmonella, infectious bursal disease, infectious laryngotracheitis, infectious bronchitis, *Mycoplasma gallisepticum* and *Mycoplasma synoviae*. The vaccine production unit's flock is screened twice yearly for Salmonella, Mycoplasma, and E. coli.

Equipment in the vaccine production unit is in varying states of repair. The most conspicuous needs are for a new laminar-flow cabinet and a back-up generator. A laminar-flow cabinet has been procured through the project but not yet delivered. Access to the vaccine production unit is physically restricted and it has yet to be confirmed whether the cabinet will fit through the door to the unit.

In 2010, Inter-Aide undertook to provide a 15 KVA generator which they have assessed will be adequate for the vaccine production unit. No target date has been given for delivery and installation of this unit. In the meantime, the VPU relies on another institution on the same premises (the CTTBD) for storage of key items such as master seed virus. Installation of the back-up generator is a high priority and should be followed up without delay. This situation is regrettable, the more so given that the lack was noted in the end-of-project evaluation of Phase 1 in July 2010.

Two chest freezers have been purchased for the vaccine production unit to store vaccine. These have not yet been installed.

Cold chain

At several points during the review, the importance of adequate maintenance of the cold chain was stressed.

In Tanzania, a cold chain study was conducted in August-September 2010. However, the review found that further information on the cold chain was required. Whilst it was clear that the vaccine was effective after delivery to Singida, there was no hard evidence that the cold chain was sufficient to ensure reliable vaccine performance.

In Mozambique, a cold chain study was conducted in November 2010 in Chigubo, Mandlacaze, Chibuto and Chicualacuala districts. The study looked at refrigerators, cooler boxes and baskets at provincial and district level. The results provided evidence of "poor cold chain conditions".

Through other stakeholders such as NGOs and other agents, the project has effected the procurement and use of cold chain equipment such as cooler boxes and refrigerators for the distribution of the I-2 vaccine.

The vaccine production units in all countries should continue assessment of the adequacy of the cold chain concentrating firstly on major distribution channels of the vaccine. There should be follow up in terms of ranking (minor, major, critical etc) and appropriate corrective action.

Output 3.3 Vaccine quality assurance program

Quality assurance is a key element of any vaccine production enterprise. To assess the adequacy of quality assurance, an expert assessment must be made. To this end, laboratory audits have been done at the vaccine production units.

In Tanzania, an audit[13] was done in December 2010 by Dr Shafqat Fatima Rehmani and a series of detailed recommendations were made. It is recommended that the project follows up on any outstanding issues from this audit, perhaps, in the first instance, requesting a response to the recommendations from the country project coordinator. Such a response would facilitate the conduct of any future audit.

While many of the recommendations covered specific operational details, one which should be considered in the context of this review relates to testing of the egg laying flock. Dr Rehmani firmly recommended that in the layer flock:

> *Sero-surveillance should be performed as a routine practice on a monthly basis for viral diseases Newcastle disease (ND), avian influenza (AI) (H5, H7, and H9), infectious bronchitis (IB), infectious bursal disease (IBD), fowl pox and Marek's disease. For bacterial infections, the flock should be free from mycoplasmosis, E. coli and salmonellosis. The antigen detection test from blood samples may be used for their diagnosis.*

The importance of such testing does not seem to be widely appreciated. In Zambia, where eggs are purchased from a commercial supplier, the vaccine production unit did not have the details of any protocol for testing of the source flock. This is not an adequate level of knowledge for eggs used for vaccine production.

Contamination of eggs with pathogens is an important risk for I-2 vaccine production. Pathogens which may be present include some of the low pathogenic viruses. There is a need to test at least the parent stock for the appropriate range of pathogens at appropriate intervals. This is true whether the source flock is a an internal flock maintained by the unit or an outside commercial flock. Testing of allantoic fluid or prepared vaccine for bacterial pathogens, as practised by all vaccine production units, is necessary but does not replace the need for flock testing as described above.

It is recommended that Dr Rehmani's recommendation be put to each vaccine production unit for consideration. The production units should adopt this recommendation or define other ways in which they can manage the risks of infection of the source flock.

In Tanzania the review team was advised that samples had been sent to PANVAC for quality testing. These samples were judged by PANVAC to be sub-standard but no details were given. It is recommended that the Tanzania country project coordinator ask PANVAC for the precise details about the nature of this shortcoming.

In Mozambique, an audit was done in December 2010 by Dr Shafqat Fatima Rehmani and a series of detailed recommendations were made[13]. It is recommended that the project follows up on any outstanding issues from this audit, similarly to the case of Tanzania.

In Malawi, an audit of the vaccine production unit and quality control was done in December 2010 by the IRPC Laboratory Technical Advisor, Dr Mary Young[14]. Again, a series of detailed recommendations were made. It is recommended that the project follows up on any outstanding issues from this audit, similarly to the case of Tanzania.

Vaccine shelf life

In all countries, there have been questions about the shelf life or stability of the I-2 vaccine. Studies are in progress in Tanzania, Mozambique, and Malawi on the shelf life of the vaccine at different temperatures. Because the production parameters for the I-2 vaccine differ from country to country, it is necessary to replicate these studies for each country. Nonetheless, it would be useful and informative for all country project coordinators to exchange the reports of such studies. The project is acquiring the information necessary to give useful information on the expected shelf life of the vaccine. Conclusion of these studies is a priority because not uncommonly, sweeping of unfounded statements are promulgated about the shelf life of the vaccine.

Output 3.4 Disease surveillance and vaccine monitoring

The main focus of this output will occur in Zambia where the field trial mentioned under 3.2 above is scheduled to take place. The trial will involve vaccination in ten villages and measurement of serological response in two of these villages. Prior to this trial, training of trainers for community vaccinators will be required. The project is exploring suitable candidates to undertake this training. As already mentioned, this program has been delayed because the necessary preparatory steps had not been completed.

It is suggested that the vaccine production unit be given extra support by the project in order to plan for timely execution of the field trial later in 2011. It is recommended that the Regional Project Coordinator visit and assist the team in Zambia in preparing for the trial. It would also be desirable to assist and advise in conducting the vaccine cost study in Zambia.

Impact of other diseases

In the field and again in government offices, the review team repeatedly heard reports of complaints of other diseases from owners who had successfully controlled Newcastle disease. Prominent amongst these was fowl pox, "eye problems" (probably mostly due to vitamin A deficiency), stick-fast flea (*Echidnophaga gallinacea*) and paralysis (possibly Marek's disease). That this is a potentially serious problem is reflected in the February 2011 PRA in Massingir, Mozambique[2], where government extension staff reported that:

> *In some community people thought that the vaccine created problems of Fowl pox and external parasites, and therefore, they are not willing to vaccinate their chickens*

Chick with Vit A deficiency
Courtesy Dr Msami

In many places, particularly in Tanzania and Mozambique, fowl pox stood out as a particularly common problem amongst chickens which had been vaccinated. In Tanzania, refresher training done in April 2011 included coverage of diseases other than Newcastle disease. Tanzania also conducted a study of the diseases amongst village chickens.

Fowl pox in particular is so often the subject of complaint from people who have vaccinated their chickens, that some investigation seems warranted to establish whether the disease is actually being spread by the vaccinators, whose work involves handling so many chickens.

Perceived low number of doses per vial of vaccine

In many cases, vaccinators do not achieve the stated number of doses per vial during their vaccination campaigns. Typically they will achieve about 270-290 drops per 300 dose vial. When vaccine production units check, they find that generally the vials do contain at least the stated number of doses. Accordingly, the response has been to assure vaccinators that tests show the vials do contain the required number of doses and that there are occasional losses of doses under practical field conditions.

Whilst this is true, it seems that the vaccine labelling should accept the fact that most users will lose drops. The labels should be worded so as to give a reflection of the number of doses per vial which is likely to be achieved under normal practical conditions. Examples might be "Average 275 doses" or "250-300 doses" or "sufficient to dose at least 270 chickens".

Output 3.5 Production, quality control and registration of I-2 ND vaccine, registration in Zambia

Vaccine production potential - an elephant in the room?

The established I-2 vaccine production units in Tanzania, Mozambique and Malawi, have all capably adjusted their production to meet demand. This demand has included significant use beyond the boundaries of the project target areas. In all cases, vaccine use within the project area, which is the main focus of the project's attention, is far outweighed by use through a range of other agencies, mainly NGOs and government extension services. This is clearly shown in Table 4 below. In terms of the ideal eventual outcome of this project, this non-project vaccine use is in one sense the elephant in the room. It is the key area where future attention should be paid if widespread adoption of I-2 vaccine is to be achieved.

A story based in Singida District, Tanzania, told at the second PCC meeting in Dar es Salaam in June 2011, can be regarded as a microcosm of the desirable outcome of the project. In this district, the project had trained/refreshed 37 community vaccinators, which prompted this "spill-over effect"[5]:

> *In February 2010, District Council using its own resources conducted a training of trainers (ToT) to a total of 18 extension officers from 26 Wards. In addition a total 630 community vaccinators from the same wards were trained.*

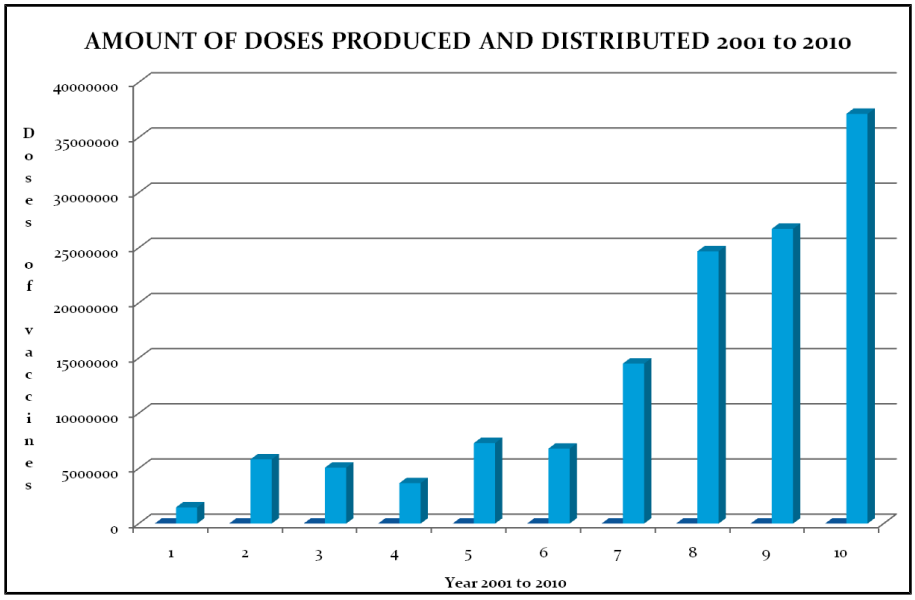
Tables 1 to 3 below show some quantitative data on overall distribution of vaccine in Tanzania, Mozambique, and Malawi respectively. These data are not precise (there are some discrepancies even within this report) but they are sufficiently accurate to be instructive.

Table 1: Summary I-2 distribution in Tanzania for period Jan-Dec 2010 (Approx 35m village chickens)

Region	Doses
Northern Zone	927,000
Central Zone	2,594,020
Eastern Zone	11,832,680
Southern Zone	1,527,000
Southern Highlands Zone	7,826,000
Western Zone	1,728,000
Lake Zone	5,391,800
Zanzibar	900,000
Total	**32,726,500**

The vaccine production unit in Tanzania distributes through District Veterinary Offices, Veterinary Investigation Centres, NGOs, and private operators. Veterinary Investigation Centres are the single biggest recipient of vaccine.

Figure 1: ND I-2 vaccine produced in Tanzania (Courtesy Dr H Msami)



Tanzania has adopted an 'in principle' ultimate target production capacity of 100m doses per year based on estimates of the country's village chicken population. At present this capacity is beyond the reach of the current infrastructure. Nonetheless, a glance at the graph shown in figure 1 above would suggest that increased demand can be expected in the next year or two.

Table 2: Summary I-2 distribution in Mozambique for period Aug 2010-Jul 2011 (Approx 23m chickens - extrapolated estimate)

Province	Doses
Gaza	979,244
Inhambane	821,302
Tete	369,586
Zambezia	789,713
Nampula	947,656
Total	**3,907,500**

Table 3: Summary I-2 distribution in Malawi Jul 2010-Jun 2011 (Approx 22m village chickens)

Purchaser/Distributor	Vials 2009/10	Vials 2010/11
SSLPP	900	1,657
Inter-Aide	956	1,373
LSPCA	1229	257
GSJ (veterinary distributors)		415
Malingunde Chitopa Association (community vaccinators)		51
Extension Workers (Lilongwe, Dedza, Salima, Kasungu, Dowa, Ntchisi, Mchinji		499
Others	426	260
Individuals		305
Total	**3,511** (=1,053,300 doses)	**4,817** (=1,445,100 doses)

The number of chickens vaccinated within the project target villages was in all cases a small fraction of the number of doses of vaccine distributed throughout the country during the year. Table 4 gives an approximate picture of the ratios by country. In the same table, the number of doses of I-2 vaccine distributed throughout the country in the year is compared to the village chicken population.

Table 4: Number of I-2 vaccine doses distributed in one year

	Vaccine doses distributed in country (A)	Chickens vaccinated in project area (B)	Ratio A/B	Ratio vaccine distributed to village chicken population[3]
Tanzania	37,140,900	87,409	425	1.06
Mozambique	3,907,500	65,765	59	0.17
Malawi	1,445,100	22,856	63	0.07

These numbers are quite approximate but they should be indicative. When one looks at the number of I-2 vaccine doses distributed annually in each country compared to the estimated number of village chickens in the country, Tanzania is clearly highest. There are probably a number of factors which have contributed to this situation, including:

- the length of time Tanzania has been vaccinating with I-2
- the level of support from government and extension services, and NGOs

3 Note that ideally chickens should be vaccinated three times each year. The ratio illustrated here should thus not be interpreted as some sort of vaccination saturation level.

- the complementary nature of other projects and programs
- support from commercially oriented institutions such as RIU, as well as small commercial distributors
- the physical environment in terms of distances, infrastructure, transport, and communications

It could be useful to analyse these issues in a suitable forum with a view to better defining impediments and opportunities for expanded use of the I-2 vaccine in each of the project countries. We will make further comments under TOR 6 on page 45 below.

Registration of I-2 vaccine

Registration of the I-2 vaccine is an important step because it gives independent endorsement to the product. It enables more freedom on the part of the government and other promoters of the vaccine to encourage its wider use. It is therefore necessary that registration be obtained as soon as possible. Should there be any outstanding impediments to registration, these should be addressed without delay.

In Tanzania, the I-2 vaccine obtained provisional registration by the Tanzania Food and Drug Authority (TFDA) in 2006. As mentioned under output 3.3 above, questions have been raised by PANVAC about the quality of the vaccine samples but the nature of the questions has yet to be clarified. An application for full registration of the I-2 vaccine together with a dossier and final submission was submitted in January 2011. It takes up to one year to process fully compliant submissions and and issue the certificate of registration.

In Mozambique, the process of registration was started under the SANDCP project. However, the vaccine was not registered because the government of Mozambique requested testing for reversion-to-virulence as a prerequisite to registration. The sequencing of the I-2 Master Seed and the reversion-to-virulence trials are now in progress at the Poultry Reference Centre at the University of Pretoria, South Africa, and are sponsored by GALVmed. It is hoped that results will be available by the end of 2011, in which case a dossier on the vaccine will be submitted to the National Directorate of Veterinary Services for registration.

In Malawi, the I-2 vaccine was registered by the Pharmacy, Medicines and Poisons Board of Malawi in March 2011. No samples of the Malawi vaccine have yet been sent to PANVAC for quality testing.

In Zambia, a submission for registration has not yet been prepared. There is still much work to be done to embed the operational procedures for vaccine production, prepare a dossier of information and submit this for registration by the government authority. Close liaison between the regional Project Regional Manager and the Country Project Coordinator for Zambia will be necessary to ensure this process is on track.

Output 3.6 Cost recovery

The emphasis under this output has been an assessment of the cost of production and distribution of vaccine and an analysis of how much should be charged to the user. The term "cost recovery" is an over-simplified and perhaps misleading term. There are a number of related elements including cost of production, cost of distribution, the minimum incentive for community vaccinators, and the charge for vaccination.

As things stand, there are some costs associated with the I-2 vaccine which the responsible agency often makes no attempt to recover. An example is the transport costs for vaccine distribution which are often borne by the supporting agency, be it government or NGO.

Cost of production

There have been efforts to assess the total cost of production of vaccine in each of the project countries. These efforts have usually been accompanied by an attempt to include the costs of distribution of vaccine to the field. It is suggested that the project is a little too preoccupied with distribution costs when the focus should be more on costing at the VPU gate, rather than beyond. Distribution agencies[4] of whatever nature will find their own

4 In Chibuto in Mozambique for example, the livestock services rely on other government services such as forestry or tourism, or private vehicles, to transport vaccine distances up to 100 km from the office.

level as far as distribution costs are concerned and users or vaccinators in distant areas may have to pay more than in others. That may well be quite acceptable in the interests of a sustainable vaccination program.

In many areas, especially in Tanzania and Mozambique where distances are more extreme, the government extension services have clearly taken a long-term commitment towards distributing the vaccine either to community vaccinators or to locations within easy reach of vaccinators. That is an acceptable solution for the medium term.

The price per dose of I-2 vaccine

Governments in each of the four target countries are involved in vaccination of livestock, not only I-2 vaccination in poultry but also vaccination of other species against other diseases. Setting a price per dose for I-2 vaccination is an important step but it becomes a complicated issue when disparities occur in policies for different situations. Rural communities are correct to question the policies as for example in the case of one village leader:

> *Why do we have to pay for this vaccine? When the government vaccinates our dogs against rabies, we do not pay. When they vaccinate our children against measles, we do not pay.*

This is a valid question which we will return to under TOR 5 on page 42.

In Tanzania, a study is in progress to determine the current vaccine production and distribution costs and to determine the cost of vaccination per bird during vaccination campaigns. The results will provide CVL with the actual cost of vaccine production, quality assurance and distribution in order to update the sale price of the vaccine. The current price in Tanzania, which has been constant for some years, is TZS 30 (USD 0.019095)

In Mozambique, the price charged per dose was fixed at MZN 0.2 per bird during the first campaigns in 1995 and it increased to MZN 0.25 in December 1999. There was a later increase to MZN 0.5 per bird (USD 0.018795) which is the current price. These prices were adopted at a national level by the Ministry of Agriculture and all the organisations implementing vaccination campaigns including national and international NGOs[10].

There have been several calls for the price of vaccination in Mozambique to be increased. The principal reason for this is to enable community vaccinators to make a larger profit on vaccination so that they have an incentive to continue vaccination. The low level of profit has been identified as a significant gap in this respect. In the August 2010 mission in Mozambique[10], Brigitte Bagnol said:

> *The official price for the vaccination of one bird fixed by the Directorate of Animal Science Mozambican Agricultural Research Institute (DCA-IIAM) should be increased to allow for a fair payment to the community vaccinators for their services making this activity attractive and sustainable. ... The price charged to the farmer to vaccinate one bird should cover the cost of the vaccine and guarantee a profit to the community vaccinator. Often, the community vaccinator does not use the 250 doses in the vial which will reduce his/her profit. There have also been complaints from community vaccinators that there are sometimes only 210 or 220 doses per vial.*

We will discuss this point at length under TOR 5.

The review team was advised that the Mozambique government has recognised the need for review of the price of the I-2 vaccine. However it equally recognises the need to review this in the wider context of prices charged by government for veterinary vaccines across the board. It regards this as an important issues and is expected to undertake the review this calendar year. This is a welcome development which the project should be aware of. We will discuss the reasons in more detail under TOR 5. The Country Project Coordinator for Mozambique should report on any progress with that review in her project reports.

In Zambia, there are plans to undertake a study on the cost of production of the I-2 vaccine. As mentioned above, it appears that VPU staff underestimate the complexity of this task. The Regional Project Manager should monitor this activity in close collaboration with project staff in Zambia in order to ensure that a cost is set before the vaccination campaign starts.

The charge per dose for I-2 vaccination in Zambia has not yet been set by the government but the review was told that there is an intention to do so. The charge will depend on the outcome of the study on the cost of production at CVRI and will take into account several other factors including the need for a financial incentive for vaccinators, possible government subsidisation, and the price received for chickens in rural areas. It is essential that the government does actually set a price for vaccination or at least a recommended price. There may be some doubt about the commitment of the government here because at the time of the review, the field trial was imminent (within weeks) but no work had been done to establish the cost of production, a prerequisite to setting a charge per dose. At the June 2011 PCC meeting in Dar es Salaam, it was said that the government of Zambia charges a minimal fee for other vaccines and it is likely to charge for ND vaccine. It is recommended that the project take active steps to maximise that 'likelihood'. The consequences of leaving the price open to interpretation and variation (disparities and inadequate incentive for community vaccinators) should be quite clear to the livestock department in Zambia.

In Malawi, the cost of one dose of vaccine is widely set at MWK 10 (USD 0.06751). A review of the costs of production and distribution of the vaccine is in progress and a draft report[15] has been produced. In the writer's opinion, this draft report needs extensive rewriting. (The argument in that report that 1,000 vials can be transported to Blantyre at a "profit" appears flawed and supports the above point that the cost at the VPU gate should be the main focus.) The associated spreadsheet appears very questionable and needs close scrutiny. The approach to setting a vaccination price is also arguable in that communities rather than government appear to be the driving factor. A telling statement in the draft report reads:

> *The communities generally settled on suggested MK 700 price, which they feel should be effected during the March 2012 vaccination campaign.*

Project staff and the livestock department in Malawi (DAHLD) should be more affirmative and more proactive than this in deciding a price per vial. Whilst the opinions of rural communities might well be sought, they do not have the wherewithal to make independent judgements on the price which should be charged for a vial of I-2 vaccine. That judgement should be made by government in a transparent and defensible way.

It is recommended that the Regional Project Manager liaise with the Country Project Coordinator for Malawi to clarify the overall approach by which the price per vial in Malawi should be decided and to review both the draft report and the accompanying spreadsheet. It is suggested that, before finalising the report, the Country Project Coordinator for Malawi should meet with stakeholders to further clarify the cost of production, explain how the costs were arrived at, and discuss the price to be charged per vial.

The above review came to the conclusion that the price per dose of I-2 should remain at MWK 10. However, DAHLD has not been active in publicising this as a recommended price. The end of project evaluation of Phase 1 recommended in August 2010 that

> *DAHLD and ADDs should unambiguously recommend to communities that they start with (or change to) a charge of K10 per chicken and review and adjust the charge only after at least two non-subsidised vaccination campaigns had taken place.*

This does not appear to have happened. Some communities are still charging MWK 5 per dose. It is reiterated that DAHLD should be quite public about this. The agreed cost per dose of 10 Kwacha should be included in its extension materials and extension messages so that communities are not left unguided on this question.

Funding of vaccine production units

In Tanzania, until last year, the vaccine production unit received support from government. Now, it is able to 'recycle' funds which it receives through vaccine sales. Details of exactly what elements of the production costs were funded through takings were not provided but this is an important question from the point of view of a healthy exit strategy for the project.

In Mozambique, the government has funded equipment but it is not clear what particular costs of vaccine production or distribution are funded using takings from vaccine sales.

In Malawi, the above-mentioned draft report on the costs of production and distribution of the vaccine[15] reveals that the funds received through vaccine sales are not currently being used for the overall operational costs of the production unit, but only for part. Significantly, staff salaries and transport costs are not covered:

> *The proceeds realized through vaccine sales are mainly used to maintain the laboratory chicken flock which supplies embryonating eggs for vaccine production. Specifically, the funds are used to buy feed for chickens, litter for the chicken house, drugs and vaccines and any consumables requested by the vaccine production unit.*

It would seem that an analysis of the income and expenditure arising out of vaccine sales is warranted. It would be folly to precipitately change the outflows from the account when the project finishes. The cash flow through this account should be managed so as to avoid any sudden changes at the end of the project.

The same draft report also makes a very important point in regard to the ability to recycle income received from vaccine sales and use it for operating the vaccine production unit.

> *Funds realized through sales of vaccine at the CVL are currently being accounted for through the project account maintained at DAHLD headquarters. ... Usually project account numbers close after termination of projects. The department should therefore think beforehand where vaccine proceeds will be deposited after termination of the project. It was previously recommended that vaccine proceeds are deposited in the DAHLD Trust Fund Account. This account is a pool account which has in most cases been found without money due to high demand for funds by government farms. It is therefore being recommended here that a separate bank account be considered for these proceeds.*

These points bring into focus the need to ensure that all vaccine production units are relatively autonomous in their normal production activities by the end of the project. This is an important consideration for continued vaccine production in the future. It should be considered in the context of an exit strategy for the project.

In Zambia, it is too early yet to analyse the use of taking from vaccine sales.

It is recommended that the Regional Project Manager liaise as necessary with each Country Project Coordinator to ascertain to what degree funds from vaccine sales can be quarantined and used for the continued operation of the vaccine production unit, especially after the end of the project. It will probably be necessary to get something firm on this, not just a general verbal assurance. If the respective departments cannot show how funds can and will be isolated and used to fund the units, the project should take appropriate steps now to try to resolve this issue because in the absence of such resolution, sustained operation of the production units might be at risk.

Component 4: Effective project management

The means of meeting this component is through regular coordination meetings at all levels. These include Project Coordination Committee meetings involving all target countries, Country Coordination Committee meetings within each country, as well as meetings at district and/or provincial level to ensure involvement and input from all stakeholders. As mentioned under Project Outputs above, the project has capably met this requirement.

Output 4.1 Project staffing

In order to provide for project staffing in each country, it was necessary to confirm or extend MOUs which had been set up under Phase 1. This was undertaken in each of the target countries. Country Project Coordinators were appointed in each country and all have been very effective in their project coordination and implementation roles.

In addition, additional resources have been utilised as appropriate. Examples are the agencies mentioned on page 16 above, whereby the project has successfully taken advantage of the complementary objectives of commercial and NGO partners in all project countries which are vaccinating.

Output 4.2 Effective project management

As mentioned elsewhere, a systematic approach to coordination, communication and collaboration through PCCs, CCCs, and direct interaction with government operatives has ensured effective management of the project and fulfilment of its objectives to date.

One of the strengths of the project management is its close contact with the users, villagers at the grass-roots level, whose livelihoods are directly affected by this project.

Regular monitoring and evaluation activities have been undertaken as well as reporting to the donor agency, AusAID[10]. The references at the end of this report show the extent of PRA/baseline missions and laboratory audits.

Financial management

The team did not assess the overall management of financial resources except to make observations on isolated issues which are mentioned elsewhere in this evaluation. Overall financial management was seen to be an on-going matter between the project accounts staff and the KYEEMA Foundation in the routine execution of the project. That said, the project should request from each participating country a statement of accounts covering the repositories for funds collected by vaccine production units through sale of vaccine. It is important that the project get a clear understanding of the management of these funds.

TOR 2: Utilisation of resources

Assess the utilisation of resources allocated to the project

Much has already been said on the utilisation of resources in the context of meeting project outputs. In general, the project has made good use of the resources available, be they physical, manpower, or financial resources.

One resource which is of particular importance is the corporate knowledge, experience and expertise within the Kyeema Foundation. This extends not only to Newcastle disease but also to poultry health and management generally, and further to the administrative and logistical challenges which are likely to crop up in a project of this nature. Apart from the general observation by the reviewer that this expertise is of immense value, the review was told independently that the training and extension material available through Kyeema was of great benefit.

Laboratory equipment and cold chain

In Tanzania, significant items acquired during the year under review included two solar powered refrigerators for Sepuka and Ihanja wards in Singida District so as to ensure cold chain provision to Msungua and Unyangwe project villages. Suitable locations to house these items have been identified and renovated and procurement procedures have been put into effect.

In Mozambique, there had been problems with obtaining high quality feed for the chicken flock. Additionally, there was a lack of local expertise to undertake maintenance work on the autoclave.

In Zambia, the laboratory equipment is generally in a good state of repair. The -86 °C freezer was not working due to power fluctuations. In addition one of the two egg incubators required recalibration because the actual temperature was higher than indicated by the gauge. VPU staff felt that the project could assist with equipment to improve the facility. They noted that air conditioners were required for several areas.

In Malawi, again most of the necessary laboratory equipment is in good working condition. The most pressing needs here (apart from a complete relocation of the vaccine production unit) were to install a laminar flow cabinet for working with virus and to ensure a reliable backup generator (see page 22).

Storage of working seed virus in Malawi left something to be desired. While the master seed and some of the working seed was kept under more reliable conditions with the CTTBD unit, other working seed was kept in the freezer compartment of a conventional refrigerator. Lack of a standby generator at this location meant that use of a conventional household refrigerator was a rather risky way of storing valuable working seed.

Transport

In general, the project is well supported in terms of transport. In Tanzania, a government vehicle is available for support to the project and in the district, government transport was generally available to support project activities.

In Mozambique, there is a Kyeema vehicle dedicated to project work. In addition, government vehicles are allocated to provide much of the transport required in the districts.

In Zambia, again government transport was sufficient to meet the needs of the project and no problem was foreseen in continuing to provide transport as required.

In Malawi, a project vehicle was present but had been off the road for over a year due to mechanical problems. A recommendation arising out of the Phase1 review for Malawi, concluded a year ago that there had been insufficient activity to retrieve the previous project vehicle or dispose of it. The recommendation that it be taken for independent assessment had not been effected. In discussions with the Project Coordinator for

Malawi, it was agreed that if possible, the vehicle should be taken to a mechanical workshop for independent assessment and that the Project Coordinator for Malawi would report on the outcome. In the meantime, the project relies for transport on vehicles owned by the Department of Animal Health and Livestock Development but the department has difficulty meeting the needs of the project.

Extension materials

There seems to have been some disparity in the uptake and use of extension materials in the different countries.

In Tanzania, the amount of extension materials used during the year under review appears to have been quite effective. This is a subjective assessment though and it is difficult to get any objective measure of effectiveness in this evaluation. Also, it is of note that the extension materials available in Tanzania were a result of the earlier SANDCP activities.

At the June 2011 PCC meeting in Dar es Salaam, Tanzania indicated that it had produced or was about to produce the following materials:

- 5,000 Kiswahili ND campaign preparation brochures
- 5,000 Kiswahili I-2 vaccine instruction leaflet
- 5,000 Kiswahili ND campaign pamphlet
- 5,000 Kiswahili ND vaccination calendars at A2 size
- 5,000 Kiswahili Fight ND poster
- 500 Kiswahili Kudhibiti Mdondo (ND) flip charts
- 1,000 Kiswahili registration books A5 size
- 600 T-shirts and caps
- 300 ND training manuals
- 1,000 Manual for community vaccinators
- 500 Extension worker manual

There have also been useful collaborative arrangements such as the "Kuku day" organised on 5 May each year in four regions of the Southern Highlands Zone. This arose out of a coincidental combination of expertise arising from SANDCP (Dr Mwamhehe), extension materials originating from the same project, and funding partly through sales of I-2 vaccine.

In Mozambique, the extension materials have been a significant factor in vaccination campaigns. In some cases, theatre groups have also been used with funding from partner organisations. The review team found consistently that T-shirts and caps were of significant value for awareness-raising within the project. As mentioned above, such items were not just a sweetener for vaccinators but were of significant value in promoting community confidence in vaccinators and better vaccination programs.

As in Tanzania, collaborative arrangements have been used in Mozambique. The project and government extension services have joined with Save the Children to work in 43 villages in four districts, using sensitisation activities through schools and donations of footballs to enhance publicity.

In Zambia, extension materials have yet to be prepared. Project staff indicated that they need to await the cost recovery study before finalising the extension materials. While this is true for some of the extension materials, others can be finalised beforehand. Since there is much to be done on preparation of these materials, it is recommended that this be given a high priority.

In Malawi, much of the extension materials were used up in Phase 1 of the project and in the year under review, few new materials have been distributed. In most cases, calendars and posters had been sufficient to cover the community vaccinators but not participating farmers. It is recommended that, funds permitting, further extension materials be prepared and distributed, especially through partner organisations such as

SSLPP and Inter-Aide. These should include vaccination calendars and posters in sufficient numbers to circulate to at least many farmers.

In all cases, it is recommended that effective, innovative means of engendering interest be adopted. Examples might be to provide say ten calendars to each vaccinator with instructions that s/he give them to those farmers who are most reliable and positive about vaccination of poultry. Posters might be designed to provide dual publicity eg:

Vaccinate your chickens three times every year
in March, July and November
Buy XXXX here!

An occasional means of community sensitisation was the use of hand-held megaphones. These have been put to good effect in some situations. The project should look at the feasibility of providing community vaccinators with megaphones to assist in their work.

TOR 3: Support for field personnel

Assess the coordination with, and support given to field personnel, both government and NGO, including provincial and district veterinary staff and extension officers

The support for government field personnel from their respective ministries and departments was universally good. In all countries, the project relies very heavily on the input of government personnel. At the field level, government staff are an essential conduit for contact and liaison with the rural communities. The team observed that all field staff were enthusiastic and generally knowledgeable about the project, its objectives and its mode of operation.

In Mozambique, the review team was told that the Directorate of Veterinary Services (DNSV) had adopted vaccination of chickens against Newcastle disease as one of its indicators of performance for its subsidiary divisions. This reflects a high level of commitment from the top.

Similar commitment was found in other countries where directors of livestock departments expressed not only their strong support for vaccination but a pleasing level of understanding of the importance of village chickens in the rural environment and the importance of Newcastle disease as a threat to their survival. The major problems and threats to the project were also generally well understood.

In all countries, field staff were enthusiastic about the objectives of the project and eager to support the rural communities. They were uninhibited about explaining any problems, impediments or failings which limited the effectiveness of the program.

The team concluded that there was a strong level of support and cohesion within all levels of the government structure through which the project operates.

Apart from a few coincidental observations, the review team was not able to measure the degree of understanding or enthusiasm of government district staff and extension officers outside of the project target areas. This is however an important question. The more of these agents understand and support the concept, the sooner their rural chicken owners will have access to the vaccine.

Support for field personnel from outside institutions such as NGOs is also an important element which should be fostered where it is feasible. In several areas, local extension staff work closely with other NGOs to promote vaccination of chickens in the context of wider programs. In Mozambique for example, government staff worked closely with Save the Children to promote vaccination beyond the immediate target area of this project.

Similarly in Tanzania, district staff have worked with RIU to incorporate chicken vaccination into a program to enhance the business side of village chicken production.

In Zambia, efforts should be made now to identify and liaise with potential NGO or commercial partners who have an interest in vaccination of village chickens. Those potential partners should be made fully aware of the objectives of the project and the likely time frame of activities.

In Malawi, NGOs such as SSLPP and Inter-Aide have given valuable support to field personnel through their training programs. These NGOs have trained extension staff from government or their field staff to train community vaccinators who have very effectively expanded chicken vaccination.

TOR 4: Support for community vaccinators

Assess the support given to community vaccinators from village leaders, project personnel, district veterinary staff and supervisors, the payment they receive and their 'job satisfaction'

Community vaccinators are a critical element in the delivery of I-2 vaccine to rural poultry owners. This has been recognised by many observers It has been recognised from the outset of the project, it has been recognised by government agencies at all levels, and it has been recognised by those assessing the project.

The End of Project Evaluation for Malawi of Phase 1 came to the following conclusion:

> *The team recognised that community vaccinators were a crucial element in enabling rural communities to take advantage of the opportunity offered by the I-2 vaccine. The importance of community vaccinators cannot be over-emphasised. ... Community vaccinators ... have a degree of loyalty, attachment and a sense of responsibility to their particular community. This provides a much higher likelihood of long-term sustainability of their vaccination programs. All else that is required is the enabling environment: vaccine, extension materials, minimal government support, and, crucially, an incentive.*

It has also been recognised in the project proposal[8] where, in its assessment of risk and risk management that "Farmers pay for the vaccine and community vaccinators remain interested in the work", it judged the risk as "high", and the consequences as "serious/fatal".

Community vaccinators get good support from project staff at all levels. Their importance and value is recognised and they are used as the key point of contact with communities which participate in the project.

T-shorts and caps
Community vaccinators, Mr Msafiri, and Dr Rosa Costa. Singida, Tanzania

They get good support from government. They are trained and supported by government extension staff and in many cases, the government intervenes by providing transport for the vaccine they need where it would not otherwise be possible. They have also received recognition (in the form of T-shirts) logistical support (vaccine, cold chain, extension materials) and moral encouragement.

They generally, but not always, get good support from NGOs. Most NGOs which get involved with Newcastle disease vaccination utilise community vaccinators and adopt training and extension materials and methods which reasonably closely follow the model promoted by Kyeema.

Certificates and bicycles - community vaccinators in Malawi - SSLPP

Occasionally however, NGOs have hindered the sustainability of their activities by not allowing for adequate (or any) incentive. This problem will be discussed in TOR 5.

In brief, the team's observations were that community vaccinators get excellent support not only from the government sector, but also from the project and NGO partner organisations. This enables them to be a key element in vaccination through providing a necessary link between extension staff and farmers.

It is thus not surprising that in general, community vaccinators are encouraged by this support from outside and are keen to continue their work.

Where support for community vaccinators is weakest however, is within the communities in which they work. Although they generally received strong moral support and encouragement from their communities and village leaders, tangible benefits were less forthcoming. In several instances, the review came across communities where vaccinators had not received an incentive adequate to maintain their enthusiasm.

Activities undertaken by community vaccinators

In the August 2010 report of the mission in Mozambique[10], Brigitte Bagnol summarised the duties of community vaccinators thus:

- *Preparation of the vaccination campaign and chicken census (potential number of chickens to be vaccinated);*
- *Meeting with local authorities to inform them about the campaign;*
- *Meeting with the community to inform them about the campaign;*
- *Collection of vaccine before the campaign;*
- *Information about the arrival of the vaccine and beginning of the vaccination;*
- *Vaccination campaign (3 days);*
- *Compilation of data;*
- *Collection of late payments and*
- *Evaluation with extension staff.*

Incentive for community vaccinators

Repeatedly throughout the review, the point was made that vaccinators need an incentive. This has been a repeated theme through many of the mission reports by Brigitte Bagnol and other social scientists. It was a point reiterated strongly in the End of Project Evaluation for Malawi of Phase 1[11]:

> *The idea that vaccinators will continue to be motivated without adequate financial reward in the long term runs contrary to every day experience in many spheres, large or small.*

In Tanzania, due to very favourable conditions, community vaccinators were earning a yearly average of 84,550 Tsh (60 US$) for the three vaccinations [9]. This seems to have been adequate although there may be other factors such as strong community support for vaccination which also provided momentum. It is not known how much was earned by community vaccinators in other non-project areas of the country where I-2 was in use but this would be very useful information.

In Mozambique, vaccinators were often not earning an adequate financial incentive. It is difficult to say but this could be a factor in poor vaccine coverage in some villages. This was a conclusion reached by Brigitte Bagnol in the August 2010 mission report[10]:

> *The vaccinators' profits from the payment of the vaccination are very low, which negatively affects the overall process.*

In the same report, she tells the story of a vaccinator who found it more lucrative to build kraals than to vaccinate chickens in a village where people were unwilling to pay. The vaccinator was of course exercising good business sense.

Similarly in Malawi, the review came across some community vaccinators who were not given any financial incentive at all. The money collected from vaccination charges had been held by the village committee but none had been allocated to the vaccinator. There has been some progress in Malawi since the review of Phase 1 in July 2010, but there is still some way to go. There has been insufficient attention to the conclusion made in that review, which cannot be better expressed today:

> *The project, government extension services, and NGO partners need to unambiguously and firmly recommend to communities that vaccinators be allowed an incentive, a realistic financial incentive, to do their work. Without a clear statement from support agencies such as government and NGOs, communities will continue to take the soft option and will be reluctant to address the long-term need for an incentive to be paid.*

It is unfortunate, but communities do seem to be tempted to take this soft option, to rely upon the vaccinator's sense of "loyalty, attachment and a sense of responsibility to their particular community". Although community members are generally well satisfied with the work done by their community vaccinators, they wish to avoid the costs involved in ensuring that it continues.

In Zambia, it is too early yet to judge this issue, but the lesson for elsewhere should not be lost. Communities there can be expected to adopt a similar attitude as has been observed elsewhere. The project in Zambia should therefore be pro-active in guiding communities. It should not leave the question to them as to whether community vaccinators should be paid. Rather, it should clearly affirm that the community vaccinators must be allowed to do their work, receive and manage the vaccination fee, and purchase vaccine for the following round of vaccination. Communities should be actively discouraged from appropriating the vaccination fee. Where collective action is required, this should be done by a committee from amongst the community vaccinators themselves.

In Zambia, there is a danger that when the price structure becomes clear, it could work against the continued motivation of community vaccinators if it does not allow for an adequate incentive. It is recommended that proactive attention be paid to this. The relationship between the price per dose of vaccine and the price of a vial of vaccine must be such that community vaccinators get the "realistic financial incentive" required for them to continue. The following table uses data from the baseline study[3] in just two villages in an attempt to predict the approximate number of chickens vaccinated per community vaccinator. If on the basis of the Tanzania experience, we assume that an adequate incentive for the vaccinator would be a net profit of USD 20 (= ZMK 95,150) per campaign, we can make some calculations to arrive at a possible price.

Table 5: Predicted chicken numbers in Zambia target villages (very approximate)

Villages	No. of HH	Proposed No. of CVs	Presumed ckns/HH	No. of ckns	Ckns/CV
Chitentabunga	105	2	11.75	1,234	617
Mutumbisha	137	2	8.7	1,192	596
Kolomwe	47	1	11.75	552	552
Muyobo Lushimbi	55	1	11.75	646	646
Mwapatisha	30	1	11.75	353	353
Nsama	131	2	11.75	1,539	770
Chipako	125	2	11.75	1,469	734
Chachima	62	1	11.75	729	729
Mutoya	261	2	14.8	3,863	1,931
Chuni	69	1	11.75	811	811
Total/average	**1,022**	**15**	**11.75**	**12,387**	**774**

Total target profit per campaign	95,150	ZMK
Expected number of chickens vaccinated	774	This is low and presumes 100% coverage.
Target profit per dose	123	= 95,150 ÷ 774
Cost per vial nett	X	Not yet set by government
Average doses per vial	250	Allow for wastage
Cost per dose nett	X ÷ 250	ZMK
Price charged to user for one chicken	(X ÷ 250) + 123	ZMK. (Plus the community charge if any; plus distribution costs)

The above is a very approximate and unrefined but it gives some indication of the sorts of calculations which might be required when the price charged per dose is considered. It should also be noted that, as already pointed out by Bagnol[3], the numbers of birds likely to be vaccinated is relatively small here, 100% coverage will not be achieved, and the parameters need to be adjusted accordingly.

Building the capacity and motivation of community vaccinators

Apart from ensuring an adequate incentive, there are important opportunities for further building the capacity of community vaccinators and thereby hopefully increasing their motivation. That this is important has been recognised from the start. The project proposal[8] included the requirement that:

> *"farmers pay for the vaccine and community vaccinators remain interested in the work"*

In describing the risk of failure to achieve this output, the risk was judged as "high" and the consequences "serious/fatal".

An idea proposed by Brigitte Bagnol and endorsed by this review is that flip charts on Newcastle disease should be developed in the appropriate language for use by community vaccinators in educating farmers. Vaccinators should be trained in the use of those flip charts. This has been discussed on page 17 above.

Another idea, related to the above, is that regular assessments of vaccinators' knowledge (preferably written) should be promoted as a way to motivate them to study and to use the material distributed.

The means of recording data by community vaccinators varies in both quality and nature from place to place. It is recommended that vaccinators be provided with vaccinator form or books which are firstly simple to complete. In the August 2010 mission in Mozambique[10], Brigitte Bagnol, without giving details, recommended that vaccinator books be simplified. The books or forms to be completed by community vaccinators should be as simple as possible. Recording the gender of the household head for instance, is the stuff of PRA and baseline studies, not ordinarily the responsibility of the community vaccinator. It might well be desirable for data collection for the purposes of this project but it is not necessary for the wider vaccination of village chickens. It is recommended that the project produce a simplified vaccination recording form which could be used as a template for community vaccinators in each country.

The review considered that the recognition of vaccinators might be improved by issuance of an identification card. Although community vaccinators can be readily identified through their T-shirts and caps, they cannot ordinarily carry around their certificates of training. The notion of issuing an identification card bearing a photograph and qualifications of the vaccinator, was endorsed by several of the government agencies and NGOs interviewed as part of this review. It is recommended that if funds are available, identification cards be issued to all trained community vaccinators. If endorsed, this procedure should be promoted with relevant stakeholders such as NGOs and government extension staff.

The training package for vaccinators should include elements of business skills appropriate for the level at which they work. In Tanzania, where there is already a high level of "business awareness" in chicken production and Newcastle disease control, the review team was surprised to learn how they managed to attain a high usage rate in terms of doses per vaccine vial. The vaccinators there had collaborated in such a way that if one had a half-finished vial at the end of vaccination, s/he would negotiate with another who had some chickens yet to vaccinate. In this way the usage per vial was optimised.

As mentioned above, it is recommended that where new community vaccinators are trained, the village leader also be given the same training. The aim here is to ensure that the village leader is fully aware of why Newcastle disease is important, how vaccination works, why chicken owners should get involved, why collection of data is important, and so on. If this recommendation is adopted, it will be important that the project promote the idea to its partner stakeholders such as government departments and divisions outside their immediate target area, and relevant NGOs.

Another development which has mushroomed is the formation of committees, associations or clubs drawn from community vaccinators themselves. This has been more successful in areas of higher chicken population density simply because distance is a mitigating factor for the formation of such associations. Hence, there have been successful examples created at Chadza, Zomba and Malingunde in Malawi, where groups in the order of 10-20 vaccinators form an association which is responsible for procurement of and payment for vaccine from the Central Veterinary Laboratory in Lilongwe, in the case of Zomba, 250 km away. There are similar examples in Inhambane and Tete Provinces in Mozambique where SANDCP previously operated.

While on the topic, it should be noted that this development supports the notion advocated on page 27 above that the project should reduce its own emphasis on estimating the distribution costs and promote private channels through which vaccine can be distributed.

TOR 5: Factors affecting project implementation

Identify major factors that have facilitated or impeded the progress of project implementation

Factors that have contributed to success

The factors which have contributed to success of this project (and those which have hindered success) include many of those identified in the End of Project Evaluation for Malawi of Phase 1[11]. They include:

1. The training capacity and training and extension materials; both in quality and coverage

The long experience of the Kyeema Foundation through its work on SANDCP and elsewhere has led to the accumulation of documents and corporate knowledge which has been well tapped for the purposes of this project. These documents and knowledge have stood not only the test of time but the test of different environments. They have been adapted for effective use each country.

2. The PRA and baseline missions

These missions have been very effective in identifying needs and measuring parameters of key importance for policies and operational aspects of the project. The review often found that conclusions it had come to for the purpose of this report had already been identified during previous missions.

3. The engagement of project personnel right down to the grass roots user level

This has enabled the project to identify strengths and weaknesses which might not otherwise be apparent. Engagement of local leaders has clearly helped achieve a high level of community response.

4. The motivation of government staff at all levels

Most especially in Tanzania and Mozambique for reasons outlined below, but definitely in all target countries. There is no doubt that government staff have worked hard to make the project a success. There is also no doubt that their contribution is essential to success. There has been good support from departmental headquarters where other priority programs might have hindered this program; at the laboratories, staff have met very high work demands at certain times; and at field level, both supervisors and field staff have worked well with the communities in their areas.

5. A clear definition of realistic objectives and outputs in the project proposal

This is a reflection of the above-mentioned expertise and experience to be found in the executing agency, Kyeema.

Factors that have hindered success

1. Lack of an adequate incentive for vaccinators

This is a major threat which is still not adequately addressed or understood, not by the communities, not by the field staff, occasionally not even by the vaccinators themselves. To reiterate, the idea that vaccinators will continue to be motivated without adequate financial reward in the long term runs contrary to every day experience in many spheres, large or small. Communities themselves will not willingly agree with this sentiment - they must continue to be guided.

2. Incomplete empowerment of communities and community vaccinators

This is a complex issue. In a nutshell, communities and their community vaccinators must ultimately be able to continue their vaccination programs without any need for continued interventions from outside bodies. In brief, communities must:

- understand the commercial nature of their chicken raising enterprise;
- understand the advantages and actual benefits of vaccination against Newcastle disease;
- have confidence in the vaccine, have confidence in extension staff and their leaders, and have confidence in their community vaccinators;
- be served by community vaccinators who are well motivated and skilled.

While the project has undoubtedly empowered many, many communities in just such aspects, there are some failures which should perhaps be the subject of further enquiry. An example is the case of Mucatine in Mozambique in which internal community differences completely forestalled poultry vaccination[2]:

> *The project also commenced in Mucatine village, but it was discontinued after the 2010 internal evaluation (Bagnol, 2010). The results from this village indicated that the community was not willing to vaccinate their chickens. The results showed that there was a serious problem of coordination between the vaccinators, community leader and the community. According to SDAE no vaccination campaign took place in this village.*

3. Emergence of other diseases of poultry

Community members are disappointed to see chickens which they have vaccinated, getting sick or dying from other diseases. Education about the fact that the I-2 vaccine protects only against one disease, Newcastle disease, is important here. So too is education about the commercial nature of their enterprise and the logic of vaccinating even in the face of risk of losses from other causes.

The concerns expressed by chicken owners about other diseases warrant further investigation. It is important to establish the full scientific basis for those concerns and to understand the potential they may have to derail vaccination programs.

4. Lack of a distinct distribution and marketing unit for vaccine production units (except in Tanzania)

The functions of such a unit should include:

- to manage stocks, sales, marketing and distribution channels for the I-2 vaccine;
- to collect data on sales and distribution and report regularly on this;
- to manage income from sales and keep auditable accounts of income and expenditure;
- to give quality advice from time to time on predicted demand for vaccine;
- (possibly) procurement of inputs for the production unit including the egg layer flock.

5. Vagueness about the price per dose of vaccine.

This again is a complex issue as mentioned on page 28 above. At the outset, it should be said that rural communities should not be left unguided to set their own price per dose of vaccine. They do not have the wherewithal to do so and variations from place to place would be disruptive in an economic sense and threaten the sustainability of the vaccination program. Left on their own, communities will also tend to set the price too low thereby not allowing an adequate incentive for vaccinators, which would again threaten the viability of the vaccination program.

The complexities here go beyond the project. In Mozambique for example, where the issues are being considered by the Ministry of Agriculture (see page 28) the challenge for the government is to resolve what services it should subsidise and to what extent. At present, vaccination for blackquarter, foot and mouth disease and other diseases is provided free of charge, which creates a disparity with the policy which applies for Newcastle disease vaccination. Rural communities have difficulty understanding the economic concepts of public and private good which are often (but not always) the basis for the seemingly differing policies. It is a welcome move that the Mozambique government appears to be wrestling with this issue.

Individual NGOs also occasionally create their own problems with respect to pricing. In Lilongwe and Dowa districts in Malawi for instance, a partner NGO involved in a wider rural support project, insisted that I-2 vaccination must not be charged for because other agricultural inputs it was supplying were not charged for. Farmers who had received other inputs free of charge would question why they should have to pay for Newcastle disease vaccination. The question of sustainability of vaccination beyond the end of that project was not adequately considered.

6. Other limitations to production potential of village chickens

Control of Newcastle disease is one thing but if the owner has significant other constraints which limit their ability to take full advantage of that, then the incentive to vaccinate is obviously less.

One of the more commonly cited constraints is housing. Most owners of village chickens house their chickens in their house at night. There are several reasons for this. In parts of Mozambique, the review was told it was because there was no adequate source of building materials nearby. In Malawi, it was told that the risk of theft was too high.

In the November 2010 mission in Tanzania[9], Bagnol made the very important point that lack of proper housing is a significant constraint to flock size. People can accommodate up to 15-20 chickens in their house at night but not more. If they wish to keep more chickens, they are compelled to construct a separate chicken house. Note that this does not mean vaccination is not profitable - people who vaccinate may not be able to keep a bigger flock but they can sell/exchange/consume chickens more often and thereby have a significantly higher turnover. But they are constrained in terms of the total flock size and therefore the potential benefits they can derive from vaccination.

Other constraints include diseases, such as fowl pox which we have already discussed on page 24, and limitations in feeding and nutrition for village chickens.

7. Lack of time, not so much for this project, but to "finish the job"[5]

The project has until June 2012 to undertake its very clear program of activities. On present indications, most outputs will be fully achieved within that time. However, there is unquestionably a crucial road ahead if vaccination of village chickens is to become as widely adopted as it ideally should. On this issue the path ahead is different in each of the four countries. If possible, the Kyeema Foundation should sit down with stakeholders from each country and plan the way forward, beyond the end of this project.

In the same context, the Kyeema Foundation should consider conducting national workshops in each target country involving a wide range of stakeholders with a theme such as "Where to from here", an attempt to consolidate the strengths and good ideas that have emerged through this and previous projects with a view to defining the path ahead. Much work has already been done on this in Tanzania which held a "National Planning and Review Workshop on Newcastle Disease Control" in Dodoma in August 2010[16]. This meeting set out the "Way forward" thus:

- We intend to convene a meeting of DVOs and convince districts to table and budget for Newcastle disease vaccination in their development programs
- Revive and implement the vaccination timetable /calendar
- We will try and see if the present projects (by Farm Africa and Oxfam) can be extended to other districts.
- We intend to train more private stockists who will disseminate the vaccines in new areas
- Encourage vet para-professionals to open up shops or form SACCOS in their districts which will help in the sales and dissemination of the vaccine.
- Send more awareness information to farmers through extension officers in the districts
- Make farmers in rural areas aware of I-2 as the vaccine of choice in controlling "Mdondo"

5 Obviously, this point is not presented as a hindrance to this project per se, but rather to the longer term aspirations and broader ideals inherent in the project concept

This workshop made reference to a comprehensive "National Strategy for Integrated Management of Newcastle Disease" for Tanzania which included such novel recommendations as "Resurrect Mwalimu Nyerere and request him to talk about poultry". That strategy document was produced during SANDCP and it is understood that Mozambique and Malawi also produced similar documents. It would be a very valuable exercise to use the Tanzanian and other documents as a basis for documentation of desirable strategies and policies to amplify the outputs of this project in the most beneficial way.

TOR 6: Strategies to overcome problems

Advise possible strategies to overcome identified problems in attaining project outputs

First, to reiterate the basic object of the proposal:

> *Implementation of a community-based ND control program that works towards:*
>
> - *strengthening the capability of, and relationship between, stakeholders in order to successfully implement Newcastle disease programs; and*
> - *achieving a decrease in chicken mortality rates caused by Newcastle disease in project areas.*
>
> *The central thread and ultimate success of this project will be the sharing of knowledge, innovation and resources. This will be done on many different levels, though most importantly it will be achieved by strengthening community networks towards self-reliance by building both knowledge and internal and external linkages to improving village poultry production."*

There are basically two periods which should be considered in the context of overcoming problems, the remaining period up to the end of the project in June 2012 and the period beyond that. The exit phase of the project should aim to ensure that everything is in place to enable not only continued vaccination afterwards but also further expansion of vaccination to areas where conditions are suitable for vaccination of village chickens.

Clearly many of the suggestions and recommendations made earlier in this report are by their nature strategies to overcome problems. However there remain a few additional broad statements which can be made in respect of the remainder of the project period. Many of these suggestions have already been proposed in respect of Malawi during the Phase 1 End of Project Review[11]. However, it is desirable to raise these matters again since there is still much ground to be covered.

A more commercial perspective

The project should seek to achieve a more commercial perspective as regards the sale and distribution of the vaccine from the vaccine production units. This was recognised in the project proposal document[8] where one of the five essential components of a Newcastle disease control program was:

> *Economic sustainability based on the commercialisation of the vaccine and vaccination services and the marketing of surplus chickens and eggs*

As an example, the project could approach other institutions, be they government, NGO or commercial, to function as distribution points for the I-2 vaccine. The project should not shy away from approaching commercial agricultural distributors to see what role they might possibly play and at what cost. The relatively short shelf life of the vaccine will mean that distribution cannot be highly decentralised but the possibility of having distribution agencies in larger centres should be further explored.

Let us not forget too the need to assist community vaccinators to understand the commercial nature of their work. Some community vaccinators in Malawi, who clearly were not being allowed an adequate incentive, told the review team that the reason why they wanted to continue their work was to assist in the country's development. The team felt that in reality they did not want the review team to know how precarious was their motivation to continue in the long term.

Form stronger partnerships with the elephant in the room

As illustrated in Table 4 on page 26, the project target areas represent only a tiny proportion of the overall use of I-2 vaccine in each of the countries where it is used. Similarly, except in Tanzania, the total country wide vaccine use is only a fraction of the estimated village chicken population. In order to improve livelihoods not just in project areas but across the board, the project should take active steps to engage with stakeholders who have an interest in village chicken production. Many of those stakeholders are already pressing ahead with

vaccination programs, not so much at the instigation of the project but because they recognise the need for vaccination and a suitable vaccine is available. But while many are doing a very capable and commendable job, there is an enormous scope for expansion. With the possible exception of Tanzania, the elephant could be much, much bigger.

One starting point would be that the project put together a package tailored for district government offices, NGOs and other institutions newly entering the field of I-2 vaccination. This package would include not only the appropriate manuals and extension materials, but also guidelines on how and where to start, potential pitfalls, advice on handling the monetary takings from vaccination, the rationale for charging for the vaccine, the pitfalls of failing to ensure vaccinators receive an incentive, and so forth. Partner NGOs do need this support if it can be given. They may not appreciate the value of T-shirts and caps for instance, or they may not appreciate the disadvantages of failing to oversee payment for vaccination and purchase of vaccine.

Establishment of a widespread sustained vaccination program requires a demand driven system. This cannot be attained in the short term but should be a conscious objective for the longer term. It entails improved networking between the Kyeema Foundation, the project, government offices in non-project areas, NGOs, commercial players, and universities and agricultural colleges. The project should actively seek out prospective partners and encourage collaboration on an expanded scale.

One reasonably simple approach to assist in expanding demand was recommended in the End of Project Review of Phase 1 in Malawi[11] but has not yet been adopted:

> *Firstly, the production unit might be provided with a small extension kit, perhaps a pamphlet, which can be distributed through these independent operators when they purchase. The kit would include messages on the significance of the disease as well as where to get vaccine and where to get more information on using it. Secondly, partner NGOs could be asked to help distribute the same or a similar kit through their clients and networks. Thirdly, some further degree of decentralisation of vaccine distribution could be established. At present for instance, not many district agricultural offices make I-2 vaccine available except through established, supported vaccination programs. There should be a significant move in this direction through the provision of extension materials and vaccine. District offices, including those in the centre and north, should be encouraged to create a market for the vaccine using well structured extension messages. This need not involve every district office but rather be structured in a way that creates "nodes" in strategic locations throughout the country which act as a focus for procurement of vaccine and procurement of extension materials. A similar move should be directed at the private sector. Opportunities for adoption of I-2 vaccine through existing retail networks should be explored with prospective partners.*

The equivalent call can still be made today, especially in the case of Malawi and less so, Mozambique. In Tanzania, there seems to have already been a fair degree of networking and the value of an extension kit at the point of distribution is less clear. In Zambia of course, it is early days but certainly the idea should be put on the to-do list.

Consistent with the recommendation on page 29 that the recommended price per dose of vaccine should be clearly stated, the price (not just of a vial but of one dose of vaccine) should be included in that extension kit.

Diseases other than Newcastle disease

The project should promote further investigation into fowl pox and other diseases, including the possibility that fowl pox is being spread by vaccinators[6].

The exit strategy

Exit strategies should be considered in each country and the way forward should be made clear. As mentioned above, Tanzania has already undertaken such a move and has mapped out its "National Strategy for Integrated Management of Newcastle Disease". In each country, the project should sit down with government to develop

6 This may have already been investigated but the review did not come across any specific study.

"strategic objectives" - a statement of outcomes about community empowerment, community vaccinators etc, how to ensure sustainability, exit strategies, and so on.

Such national strategies should include long-lasting measures which seek to ensure that the income from vaccine sales is re-channelled to cover the costs of vaccine production and not diverted to other activities. How this can be done will depend on the laws and policies of the respective governments.

Consolidation of corporate knowledge is another important aspect of the exit strategy. The extension materials and manuals adapted for use in each country should be archived, probably by the Kyeema Foundation itself, where possible in electronic form. In common with a recommendation in the August 2010 mission in Mozambique, it is recommended that the project in each country collect data on vaccinators (when first trained, participation in training and refresher training). This should include vaccinators who have been trained through other agencies such as NGOs.

Recommendations

1. Where community vaccinators are selected for training, the village leader should also be encouraged to attend the full training course for community vaccinators, not just part, but they should not routinely participate as vaccinators within their village. The extra effort and cost of this is considered to be worthwhile through ensuring that village leadership is better equipped to promote vaccination through a better understanding of the whole process. (See pages 15).
2. The quantity and distribution of extension materials in the different countries should be reviewed and targets set in terms of distribution to extension staff, village leaders, community vaccinators and users. Each vaccinator might be given say 10 extra copies of vaccination calendars which they could distribute as a small incentive to the most successful and cooperative of their client farmers. (See page 17).
3. Flip charts on Newcastle disease which have been developed in the appropriate language should be used by vaccinators in educating farmers. Community vaccinators should be given guidance on the use of those flip charts. (See page 17).
4. The extension materials should include an increased emphasis on educating rural people about the commercial nature of their village chicken enterprise. In Zambia, extension activities in should pro-actively address this matter in order to pre-empt disruption or confusion to the vaccination program. (See page 17).
5. In the training of laboratory technical staff for work in vaccine production, there should be some form of formal signed agreement between all parties before training is started. Such an arrangement should not only involve the employee and the project but also the employee's administrative supervisors, ie those whose approval of leave is required. The agreement would include conditions applying to voluntary departure from the work place within a specified period after training. (See page 19).
6. The marketing/distribution unit which exists at the vaccine production unit in Tanzania should be used as a model for other countries which should better define and isolate the functions of vaccine marketing and distribution. It is suggested that the Project Coordinator for Tanzania be requested to make a presentation at the next PCC meeting (or other suitable forum) so that other countries can better understand the function and operation of this unit. (See page 20 and 42).
7. The procurement of equipment by CVRI for the vaccine production unit in Zambia should be followed up by the Kyeema Foundation Technical Manager. (See page 21).
8. The vaccine production unit in Malawi should, as a matter of high priority, be relocated to a suitable location, separate from areas in which diagnostic and post-mortem work is performed, and with significantly increased work space. The project should explore means of addressing this shortcoming and liaise as appropriate with the various stakeholders. (See page 21).
9. The vaccine production units in all countries should continue assessment of the adequacy of the cold chain concentrating firstly on major distribution channels of the vaccine. There should be follow up in terms of ranking of defects (minor, major, critical etc) and appropriate corrective action. (See page 22).
10. Each vaccine production unit should consider the recommendation of Dr Shafqat Rehmani that "Sero surveillance should be performed as a routine practice on a monthly basis for viral diseases Newcastle disease (ND), avian influenza (AI) (H5, H7, and H9), infectious bronchitis (IB), infectious bursal disease (IBD), fowl pox and Marek's disease. For bacterial infections, the flock should be free from mycoplasmosis, E. coli and salmonellosis. The antigen detection test from blood samples may be used for their diagnosis." The production units should adopt this recommendation or define other ways in which they can manage the risks of infection of the source flock. This should apply whether the source flock is a an internal flock maintained by the unit or an outside commercial flock. (See page 22).
11. It is recommended that the project follows up on any further outstanding issues from the audits which were done of the vaccine production units in each country. (See page 22).

12. The Project Coordinator for Tanzania should ask PANVAC for the precise details about the nature of the shortcoming for the "sub-standard" samples of vaccine which were tested. (See page 23).
13. Studies in progress in Tanzania, Mozambique, and Malawi on the shelf life of the vaccine at different temperatures should be analysed and reported as soon as possible because not uncommonly, sweeping or unfounded statements are promulgated about the shelf life of the vaccine. Country Project Coordinators should exchange the reports of such studies. The project is acquiring the information necessary to give useful information on the expected shelf life of the vaccine. (See page 23)
14. It is suggested that the vaccine production unit in Zambia be given extra support by the project in order to plan for timely execution of the field trial later in 2011. It is recommended that the Regional Project Coordinator visit and assist the team in Zambia in preparing for the trial. It would also be desirable to assist and advise in conducting the vaccine cost of production study in Zambia. (See pages 23 and 28)
15. The reports of investigations into diseases other than Newcastle disease, which have troubled people whose chickens have been vaccinated, should be tabled and subjected to further enquiry and discussion. The project should likewise foster enquiry and discussion on the possibility that fowl pox is being spread by vaccinators, whose work involves handling so many chickens. Unless such spread is judged highly unlikely, the project should explore means of investigating through a properly designed simple field trial. (See page 24).
16. The labelling of vaccine should be amended to allow for user error in terms of doses per vial. The labels should be worded so as to give a reflection of the number of doses which is likely to be achieved under normal practical conditions. Examples might be "Average 275 doses" or "250-300 doses" or "sufficient to dose at least 270 chickens". (See page 24)
17. Registration of the I-2 vaccine should be obtained as soon as possible in each country: full registration in Tanzania, and registration in Mozambique and Zambia. Should there be any outstanding impediments to registration, these should be addressed without delay. (See page 27).
18. The project should examine the significance of vaccine distribution costs vis-a-vis costs of production at the VPU gate. The practicality of assessing distribution costs based on expensive government managed transport vs private alternatives should be examined. (See page 27).
19. The Country Project Coordinator for Zambia should take steps to complete a study on the cost of production of I-2 vaccine as a matter or priority. The information should be used to calculate a proposed price per dose of vaccine in accordance with the principles outlined in this review. The Regional Project Manager should support and assist the Zambian team in this endeavour. (See page 29)
20. Project staff and the Department of Animal Health and Livestock Development in Malawi should be more affirmative and more proactive in deciding a price per vial. Whilst the opinions of rural communities might well be sought, they do not have the wherewithal to make independent judgements on the price which should be charged for a vial of I-2 vaccine. That judgement should be made by the Malawi government in a transparent and defensible way. The agreed cost per dose should be included in its extension materials and extension messages so that communities are not left unguided on this question. (See pages 29, 42).
21. The Regional Project Manager should liaise with the Country Project Coordinator for Malawi to review both the draft report on cost of production and the accompanying spreadsheet. (See page 29)
22. The price per dose of vaccine should be included in extension materials and extension messages so that communities are not left unguided on this question. (See page 29)
23. The Regional Project Manager should liaise as necessary with each Country Project Coordinator to ascertain to what degree funds from vaccine sales can be quarantined and used for the continued operation of the vaccine production unit, especially after the end of the project. It will probably be necessary to get something firm on this, not just a general verbal assurance. If the respective departments cannot show how funds can and will be isolated and used to fund the units, the project should take appropriate steps now to try to resolve this issue because in the absence of such resolution, sustained operation of the production units might be at risk. (See page 30).

24. The project should request from each participating country a statement of accounts covering the repositories for funds collected by vaccine production units through sale of vaccine. It is important that the project get a clear understanding of the management of these funds. (See page 31).
25. The project vehicle in Malawi, which has been off the road since early 2010, should be taken to a mechanical workshop for independent assessment and a report on the findings made to the Regional Project Manager. (See page 33).
26. In Zambia, preparation of extension materials which do not have to await a decision on the cost of the vaccine should be finalised as a matter of high priority. (See page 33).
27. In all target countries, it is recommended that effective, innovative approaches to extension be adopted. Examples might be to provide say ten calendars to each vaccinator with instructions that s/he give them to those farmers who are most reliable and positive about vaccination of poultry. Posters might be designed to provide dual publicity. (See page 34).
28. The project should look at the feasibility of providing community vaccinators with megaphones to assist in their work. (See page 34).
29. The project, government extension services, and NGO partners need to unambiguously and firmly recommend to communities that vaccinators be allowed an incentive, a realistic financial incentive, to do their work. Without a clear statement from support agencies such as government and NGOs, communities will continue to take the soft option and will be reluctant to address the long-term need for an incentive to be paid. In Zambia, the project should clearly and pro-actively affirm to communities that the community vaccinators must be allowed to do their work, receive and manage the vaccination fee, and purchase vaccine for the following round of vaccination. (See pages 37 and 41).
30. In Zambia, the project should finalise the recommended price per dose of vaccine ensuring that the community vaccinators will receive an adequate incentive. (See page 38)
31. It is recommended that the project produce a simplified vaccination recording form which could be used as a template for community vaccinators in each country. (See page 39).
32. It is recommended that if funds are available, identification cards be issued to all trained community vaccinators. If endorsed, this procedure should be promoted with relevant stakeholders such as NGOs and government extension staff. (See page 39).
33. The training package for vaccinators should include elements of business skills appropriate for the level at which they work. (See page 39).
34. The project should foster and promote the formation of committees, associations or clubs drawn from community vaccinators themselves, whose function is to manage procurement of and payment for vaccine from the selected source. (See page 40).
35. The project should try to define a way forward beyond the completion date of June 2012. If possible, the Kyeema Foundation should sit down with stakeholders from each country and plan the way forward, beyond the end of this project. In the same context, the Kyeema Foundation should consider conducting national workshops in each target country involving a wide range of stakeholders with a theme such as "Where to from here", an attempt to consolidate the strengths and good ideas that have emerged through this and previous projects with a view to defining the path ahead. (See page 43).
36. The project should seek to achieve a more commercial perspective as regards the sale and distribution of the vaccine from the vaccine production units. (See page 45).
37. In order to improve livelihoods not just in project areas but across the board, the project should take active steps to engage with stakeholders who have an interest in village chicken production. If possible Country Project Coordinators should discuss the situation in each country in a suitable forum. The project should put together a package tailored for district government offices, NGOs and other institutions newly entering the field of I-2 vaccination. This package would include not only the appropriate manuals and extension materials, but also guidelines on how and where to start, potential pitfalls, advice on handling the monetary takings from vaccination, the rationale for charging for the vaccine, the pitfalls of failing to ensure vaccinators receive an incentive, and so forth. (See pages 45 and 24).

38. The project should foster a widespread sustained and demand driven vaccination program for the longer term. It should actively seek out prospective partners and encourage collaboration on an expanded scale. This entails improved networking between the Kyeema Foundation, the project, government offices in non-project areas, NGOs, commercial players, and universities and agricultural colleges. (See page 46).
39. The production units in each country should provide a small extension kit, perhaps a pamphlet, which can be distributed through independent operators when they purchase vaccine. The kit would include messages on the significance of the disease as well as where to get vaccine and where to get more information on using it. It would also include the recommended price per dose. Partner NGOs could be asked to help distribute the same or a similar kit through their clients and networks. (See page 46).
40. The project should explore the feasibility of increased marketing and distribution of vaccine through government district offices through the provision of extension materials and vaccine. This should be designed and targeted in a way that creates "nodes" in strategic locations throughout the country which act as a focus for procurement of vaccine and procurement of extension materials. It should include a similar move directed at the private sector. Opportunities for adoption of I-2 vaccine through existing retail networks should be explored with prospective partners. (See page 46).
41. The project exit strategy should be better defined. In each country, the project should liaise with government to develop "strategic objectives" - a statement of outcomes about community empowerment, community vaccinators etc, how to ensure sustainability, exit strategies, and so on. Such national strategies should include long-lasting measures which seek to ensure that the income from vaccine sales is re-channelled to cover the costs of vaccine production and not diverted to other activities. How this can be done will depend on the laws and policies of the respective governments. (See page 46).
42. The project should assist to consolidate corporate knowledge. The extension materials and manuals adapted for use in each country should be archived, probably by the Kyeema Foundation itself, where possible in electronic form. (See page 47).
43. The project coordinators in each country should collect data on vaccinators (when first trained, participation in training and refresher training). (See page 47)

Mdai Njou from Singida, Tanzania, feeds some of his 300 village chickens

In Conclusion

Not every village chicken owner in southern Africa can, or perhaps even should, aspire to own 300 chickens as does Mr Mdai Njou. However, with time and perseverance, literally millions of chicken owners should be able to keep their flock of chickens without the threat that they will be wiped out by Newcastle disease.

This project will not achieve that end but it will definitely have been a crucial part of the beginning stages.

Thought should be given now as to where we go from here. We must think in the broader picture, not just focussed target villages but whole countries. We should be thinking about broad access to vaccine and wider spread of knowledge. Tanzania is obviously doing well in this regard and should be looked on as some sort of model.

But this will not just happen. Further effort is required. Australian agencies in the form of ACIAR and AusAID have championed this cause in southern Africa for over a decade. No other aid agencies have so well focussed on the most important threat to village chicken production in the region. But still, we must think of how to reach that broader end point. We should not stop here. As our Mozambican friends would put it:

A luta continua - the struggle continues!

Questions put to village community members and community vaccinators

Note: This list of questions is indicative. Not all these questions were put to all communities. There was considerable variation from one location to another.

Regarding the livestock situation in this area:

1. What classes of livestock exist in your village?
2. Of all classes of livestock, which are most important to you?
3. For what reasons?

Regarding vaccination and chicken raising:

1. What are the problems involved in raising chickens?
2. What has been the impact of this project? How has the raising of chickens changed since the project began?
3. What do you think of the cost of vaccination? Is it too much or is it acceptable?
4. Do you like the I-2 vaccine? Do you want to continue using it? Why?

Regarding marketing of chickens:

1. How are chickens marketed in this area? Are the greater number consumed or sold/exchanged?
2. What is the price of a chicken if sold in this area? Give examples for a small chicken and a large chicken.
3. If your sell your chicken in … (a more distant bigger market) what might you expect to receive?

Regarding feeding and housing of chickens:

1. Do you supplement the feed for your chickens in the dry season when food is short?
2. If so, what do you use?
3. Where do your chickens sleep at night? Do you build a chicken house?
4. If not, why not?

Regarding the support given to community vaccinators:

1. How do communities and their leaders support your work? Are they generally helpful?
2. How do government and project extension staff support your work?
3. Do you have sufficient money to purchase vaccine when it is required?
4. Is there sufficient money to give you an incentive?
5. Are you satisfied with your role? Are you keen to continue in future I-2 vaccination campaigns?

Extension materials used by community vaccinators:

1. What are the extension materials and methods you use to promote vaccination?
2. Which of these is most effective in your view?
3. What materials would you like to have in future?

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