

## Effects of vaccination against the Newcastle Disease using I-2 vaccine in Malawi

Field studies' results and lessons from Inter Aide and BASEDA's experiences with organized community vaccinators

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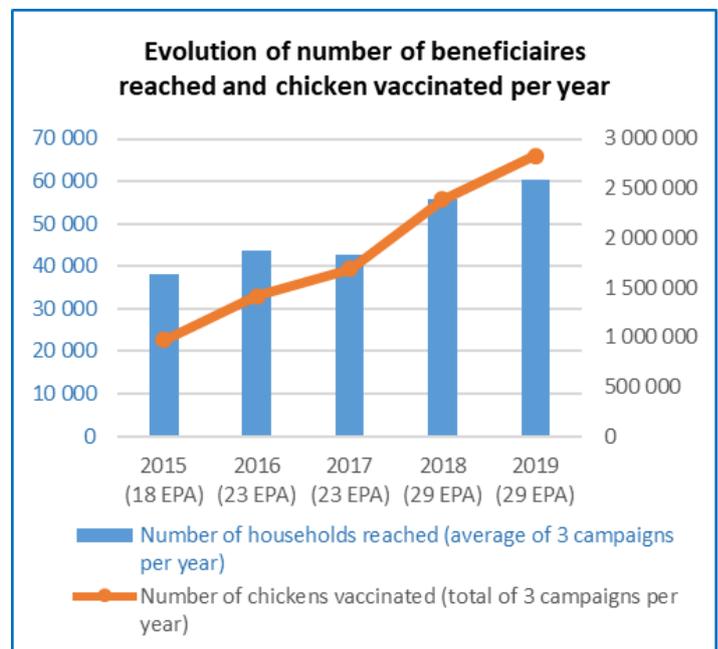
### I. Background

Village poultry is of great importance for Malawian rural households' livelihoods. But one of the main constraints to village chicken production in Malawi, like in many other parts of Africa, is the frequent devastation of flocks by Newcastle Disease (ND)<sup>1</sup>. Inter Aide started implementing a Newcastle Disease control program in Malawi in 2005 by organizing network of community vaccinators using the I-2 (Isolation 2) vaccine in 3 districts: Lilongwe (Center region), Zomba and Phalombe (Southern region). This thermo-tolerant vaccine, produced at low cost in Malawi by the Ministry of Agriculture, is adapted to rural vaccination. It has proven its effectiveness in controlling the disease and increasing the chicken population of vaccinating households if administrated 3 times a year<sup>2</sup>.

In 2017, Inter Aide handed over the project to BASEDA, a local Non-Governmental Organization, but still provides a technical and advisory support to this project. Today, an average of 544 trained community vaccinators are active in 3 different districts. Among them, about 350 have gathered in 3 different 'grass-roots' associations and the others who are at an earlier stage of development are organized into local clubs. Community vaccinators associations (2 in southern region, 1 in central region) are able to order and pay for vaccines on their own, while the local clubs are still depending on the project's logistic to access vaccines and will only reach the next level of organization after 2 to 3 years of activity and trainings. Vaccinators buy vaccines from the Central Veterinary Laboratory in Lilongwe without any subsidy from the project, organize 3 vaccination campaigns per year in their catchment areas, and report to the project and government staff at the end of every vaccination campaign.

Their objective is to vaccinate a maximum of chickens registered in their catchment area by offering their services to farmers at an affordable price (around 0,03 Euro /chicken). Vaccination is a demand-driven, payable and trusted service (only 3% of surveyed households say they are doubtful about I-2), whose sustainability is greatly reinforced by its immediate impact for poultry farmers and a regular source of income for community vaccinators.

The project has also achieved a significant extension of its activities since 2015 as shown on the opposite chart.



### An entrepreneurship-based approach providing incomes to vaccinators

The latest results from 2019 show that a vaccinator earns on average 45 euros per campaign, or 135 euros per year. Such incomes are invested in activities which improve the household's livelihoods, e.g. procurement of food, payment of school fees for children, purchase of livestock, bicycle, ...

#### **A small-scale entrepreneurship business model for 544 vaccinators**

- 1 vaccine vial costs only €1.3 (maximum 2.5 € after adding commission for associations)
- Benefit = €6 to €7 per vial, for a 1-day work (6 hours)
- To be compared with €1 paid for 1-day when farming as a casual worker
- 20 days of vaccination = income of 120 days of farm casual labour
- 22% of vaccinators realize a profit between €150 and €820 per year

<sup>1</sup> Aichi J. Kitalyi, FAO (1998)

<sup>2</sup> Mgomezulu & all (2009)

## II. Measurement of impact of chickens' vaccination with I-2 for poultry farmers

Although a number of studies have proven the efficiency of I-2 vaccines in terms of immune protection of the vaccinated chickens<sup>3</sup> and the fact that repeated treatment of chicken flocks every 4 months leads to an increase in the flocks size over time<sup>4</sup>, **few studies have demonstrated its effect on the reduction of chicken mortality rate**. In Malawi, a study conducted on the topic in 2010 by SSLPP in Lilongwe district concluded that *“the rate of deaths and the rate of overall losses to Newcastle Disease for household which did not vaccinate was about 2.6 times the rate of deaths/losses for household which did vaccinate”*<sup>5</sup>.

### 1. Summary of studies and methods

From July 2015 to November 2016, Inter Aide implemented a baseline survey, followed by campaigns follow-up surveys every 4 months, coinciding with the 3 annual vaccination campaigns. In total 1940 households were surveyed in 4 EPA (Extension Planning Areas) in Lilongwe (Chiwamba, Chigonthi, Malingunde, Ming'ongo) and 3 in Phalombe (Mpinda, Waruma, Naminjiwa) during a minimum of 2 to a maximum of 4 vaccination campaigns (some households were not available every campaign). This survey sampled households randomly in the villages, whether they were vaccinating or not, using a cross-sectional approach (comparing results for vaccinating or non-vaccinating households, without looking at the change over time).

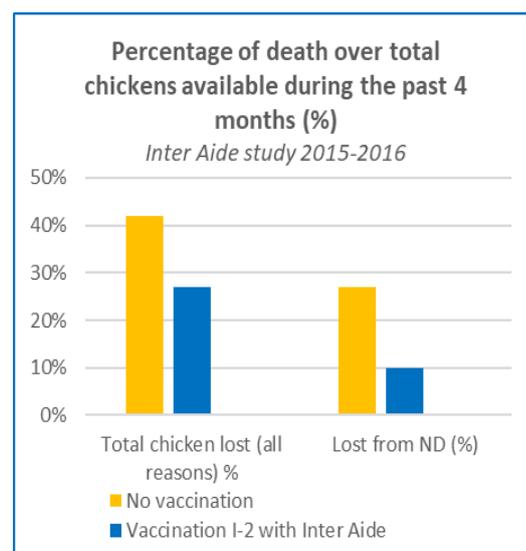
Another comparative study, using 2 longitudinal surveys collecting the same variables over time, was conducted in March 2018 and March 2019, just before the start of March vaccination campaign. The survey, which includes a control area without vaccination services implemented by BASEDA, was conducted in Lilongwe and Phalombe districts on 611 households in 4 EPAs (Ukwe and Nkhulambe EPA with vaccination services and the 2 neighboring EPA Demera and Milonde EPA without vaccination services).

Data on available chicken, overall mortality, mortality by Newcastle Disease and other chicken flock' figures were collected following declarative statement from farmers for the counting and events that happen in their flock during the past 4 months (2015-2016 survey) or the past 3 months (2018-2019 survey). Despite the possibility of a diagnostic error from the owners when declaring deaths of their chickens due to Newcastle Disease, the decrease of overall death rate remains a good indicator to confirm the vaccination impact.

### 2. Results and effects on poultry mortality

The cross-sectional survey of 2015-2016 shows that **households who vaccinated their chickens with Inter Aide using I-2 lost significantly less chickens (death rate of 27%) compared to households who did not vaccinate and for which the study found a death rate of 42%**. The death rate allocated to the Newcastle Disease losses was only 10% for the vaccinating households while it was 27% for the non-vaccinating households.

**In complement, the longitudinal survey of 2018-2019 shows clearly that consistent vaccination campaigns enable families newly benefiting from the project to reduce the overall death rate by 36% and the mortality from Newcastle Disease by 63% compared to before vaccination**. In other words, households who start vaccinating lose **2.7 times less chickens** due to Newcastle disease after one year of vaccination. It has to be underlined that the figures regarding the reduction of Newcastle Disease mortality are almost exactly similar to what has been observed in the survey conducted by SSLPP in 2010.



BASEDA 2018-2019 survey	CONTROL AREA			INTERVENTION AREA		
	2018 (No vaccination)	2019 (No vaccination)	% change	2018 (No vaccination)	2019 (Vaccination Baseda)	% change
Mortality rate ND	37%	47%	28%	42%	15%	-63%
Global mortality rate	48%	59%	22%	53%	34%	-36%

<sup>3</sup> Hening & all (2006)

<sup>4</sup> Mgonezulu & all (2009) and Mwachazi, SANDCP (2005)

<sup>5</sup> Boland, SSLPP (2010)

## Results according the sources of vaccination

Inter Aide 2015-2016 survey	Sources of vaccination (operator)			
	Government	Inter Aide	Others	Private
Lost ND (number of chicken)	863	2175	463	1943
Total chicken (own, sold, consumed and lost)	4134	20723	1815	9302
Nb HH	286	1223	114	494
Percentage mortality	21%	10%	26%	21%

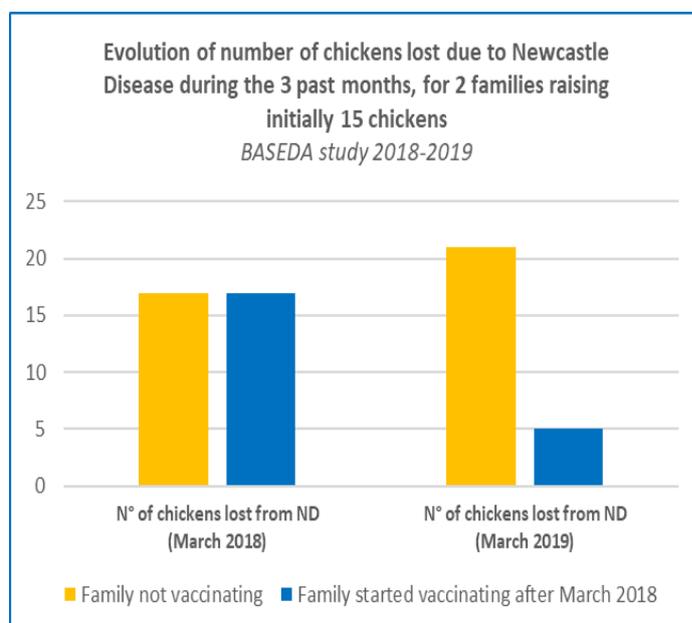
The data here above shows that **vaccination provided by the project seems to be more effective than the one performed by other stakeholders**. This could be due to the intensive training provided to the vaccinator under the project, as well as the quality-oriented approach promoted by the associations and vaccinators in order to earn the loyalty of poultry farmers. The less significant results obtained by the vaccination done outside Inter Aide scope could be explained by the fact that they include different types of vaccine (I-2, Lasotha, Hitchner, ...) and a range of actors (government AEDOs, AVO, Vet scouts, CAHW<sup>6</sup>, NGO workers and private individuals) following or not the vaccination calendars. Therefore, this does not enable us to assess their isolated impacts. Nevertheless, it gives us confidence that the approach used by Inter Aide, and now BASEDA, which follows the recommendations from the Ministry of Agriculture Irrigation and Water Development<sup>7</sup>, is producing one of the highest impact for the rural communities.

### 3. Results and impact on poultry farmers' capital and incomes

As the 2 surveys mentioned in this report did not follow precisely the flow of animals in farmers' flocks, but only had a picture of the movements during the 3 or 4 months prior the survey, it is quite difficult to ascertain the benefits in terms of flock size or sales' evolution (which can be affected by households personal decisions) and hence the economic impact for the families.

As shown in the previous tables of results, after 1 year of vaccination, the mortality due to Newcastle disease decreased by 63% for households who started vaccinating their chickens. On the opposite, in the control area, households still not vaccinating have seen the mortality of their flock increasing by about 28% during the same year. In order to give an idea of the losses prevented thanks to vaccination against Newcastle disease, we proposed to model the results by considering 2 average households, having each 15 chickens before the first vaccination campaign in March 2018, one representing the control area (no vaccination before March 2018 and still no vaccination until March 2019) and the other the intervention area (vaccination starting from March 2018 onwards).

According to the collected data, such households were losing each 17 chickens during the 3 months prior to the first survey.



This simple modelling shows that one year after, a family that started vaccinating its chickens in the intervention area had lost only 5 chickens from Newcastle disease, while a family in the control area who is still not vaccinating had lost 21 chickens during the past 3 months preceding the survey. If we consider that the average value of a live chicken is around 2000 Mk (2,4 euros), **the family vaccinating its chickens saved about 32,100 Mk (39 euros) of losses in only 3 months by avoiding the death of additional chickens due to Newcastle disease.**

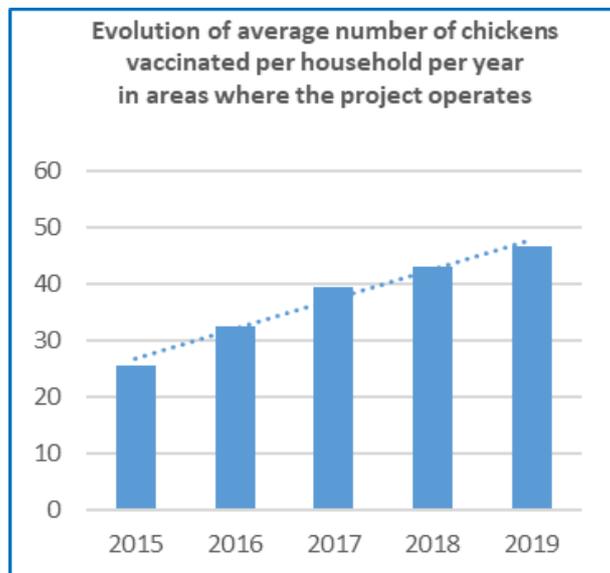
If this model only intends to give a concrete picture of families' interest in using the service of well-trained vaccinators using I-2 eye-droppers, further studies could assess more precisely the economic impact by following the exact weekly or monthly stock and exhaustive movements of poultry farmers' flocks over a certain period of time.

<sup>6</sup> AEDO (Agriculture Extension Development Officer), AVO (Agriculture Veterinary Officer) and Vet scouts are extension agents employed by the Ministry of Agriculture, while the CAHW (Community Animal Health Workers) are volunteers trained among community members.

<sup>7</sup> The main non-exhaustive recommendations are the following: using the thermostable I-2 vaccine for rural poultry vaccination by well-trained vaccinators, quarterly vaccination (March, July and November), respecting guidelines on eye-droppers' storage conditions, no vaccination of sick chickens, hygiene and hands washing after vaccinating each farmer's birds, ...

### III. Discussions and recommendations

The studies done by Inter Aide and BASEDA show indubitably that vaccinating chickens against Newcastle disease using I-2 vaccine enables to substantially decrease the mortality in rural flocks, hence avoiding important losses of capital for smallholder farmers. From the data collected by the project, it is a fact that 88% of the households using the vaccination services promoted by BASEDA have less than 20 chickens at a time, which confirms that the service mainly benefits small-scale poultry farmers and improves their livelihoods. As shown in the opposite chart, **the average size of the vaccinated flock per family in the 3 districts of intervention has increased by 83% in the past 5 years**. Although there might be other factors influencing this evolution, this indicator reinforces the findings of these 2 surveys and suggests that consistent vaccination against Newcastle disease has gained the confidence of rural communities and participates in increasing the size of their chicken flocks. Nevertheless, we recommend that further studies could ascertain this statement by conducting similar surveys following over time the precise weekly or monthly stock and the exhaustive movements of poultry farmers' flocks for households who do vaccinate their chicken and others who do not.



The fact that poor rural households have been increasingly using Newcastle Disease vaccination services during the past 4 years, despite a difficult economical context for the families in the 3 districts of intervention<sup>8</sup>, demonstrates the motivation to pay for this service and its crucial impact for the families' resilience. But if controlling the Newcastle Disease in rural conditions with I-2 definitively produces a positive impact for the families vaccinating, **the studies confirm that poultry farmers who vaccinate still lose more than a quarter of their flock due to other reasons**. About 16% of the flocks die from predation, other diseases and accidents, and about 10 to 14% still die from Newcastle Disease. The latter observation is not surprising as it is estimated that about 60% of the households vaccinating their chickens under this project only ask for this service once during their first year of vaccination, leaving their flocks unvaccinated during the 2 next campaigns. This can be easily explained as a strategical risk mitigation measure from farmers as vaccination was a new service implemented in their area and one can understand that they would need more time to be convinced and that the vaccinator will need few campaigns to earn customers' trust and loyalty. Also, for some economic reasons and risk-taking strategies, an important part of the families, estimated at about 20%, does not vaccinate their chickens thrice a year, but rather twice or even once, leaving their flocks vulnerable to Newcastle disease outbreaks during 4 to 8 months every year. By regularly raising awareness during the vaccination campaigns and maintaining a quality service accessible to rural poultry farmers, community vaccinators have a great role to play in helping them to reduce the Newcastle disease losses to a minimum.

Reducing the mortality due to Newcastle disease is the first leverage to increase chicken production and the studies presented in this report have proven its efficiency and impact. Other improvements in the management of rural chickens can help farmers to increase their flocks and improve their livelihoods: increased care and protection of young chicks, good housing and prevention against predators, prevention and treatment against other diseases and parasites, etc. Although in theory those factors are well known, we still lack the concrete understanding of why some households are able to reach that stage of poultry management and others not. This is a crucial gap to be addressed in order to better advise small-scale poultry farmers. Although a zero-death situation will remain impossible to achieve, farmers should receive proper advice in order to set their priorities and decide which remaining aspects of the production aspects they would like to improve and would be able to address according to their capacities and the services available within their communities.

Although the average size of chicken flocks has been greatly increasing for vaccinating households over the past years thanks to the availability and effectivity of Newcastle disease vaccination services, the potential of evolution towards more productive small-scale poultry farms remains probably quite significant. To assess this assumption and understand how rural poultry farming could be more profitable, we recommend to conduct deeper case-study of successful households to understand which strategies they have put in place to reach a higher professionalism in poultry management and which factors lead them to success.

<sup>8</sup> The 3 districts were affected by prolonged dry spells in 2017-2018 season and 2 districts (Phalombe and Zomba) by heavy floods in 2018-2019 season, which led the government to declare them as "sites of national disaster".

#### IV. References

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