Effect of Technical Interventions on Chicken Productivity and Household Welfare in Selected Villages of Bariadi district, Tanzania

James Lwelamira, John Safari and Zacharia Masanyiwa*

Institute of Rural Development Planning, P.O. Box 138, Dodoma, Tanzania
**Corresponding author's email:jlwelamira@irdp.ac.tz*

Abstract

This study was carried out in three selected villages of Bariadi District, Tanzania in June 2012 to evaluate the effect of technical interventions on chicken productivity and household wellbeing. The study involved a cross-sectional survey of 90 randomly chosen project beneficiaries. Data were collected using a semi-structured questionnaire and analyzed using Statistical Package for Social Sciences version 16. Comparison of the test variables before and after interventions showed that interventions resulted in increased average number of birds per household (from 23 to 80 birds, $t = 15.8$, $p < 0.001$), reduced average period to attain market weight (from 8 to 6 months, $t = 4.58$, $p < 0.01$), and increased average egg production per hen per year (from 56 to 82 eggs, $t = 13.65$, $p < 0.001$). The results also showed reduction in mortality rate from the average of 34 – 84% to less than 25% after interventions. On the other hand, household income from poultry enterprise increased from an average of TZS 50,170 to TZS 426, 240 per household per year. These improvements also led into increased household food security, household assets, and ability to meet basic household needs and social services. Nevertheless, prevalence of parasites and diseases and scarcity of feed ingredients were still the major challenges facing the chicken industry. Concerted efforts are needed to control chicken diseases by enhancing local capacity in supply of veterinary services and promoting the use of alternative and cheap feeding ingredients and collective marketing strategy would stimulate chicken farming and improve household income and the welfare of small scale farmers.

Key words: Chicken productivity, small scale farmers, household welfare

1. Introduction

Indigenous chickens account for the majority of chicken population in Tanzania and other developing countries. These chickens are mostly kept under extensive management system in rural areas. Studies have shown at least 80% of rural households of Sub-Saharan Africa keep local chickens (Msoffe, 2003; Illango *et al*., 2005; Dana, 2011). However, chicken productivity is generally low (Melesse and Giorgis, 2012; Justus *et al*., 2013). Consequently, its potential to contribute to household income and welfare has not been fully exploited particularly due to poor management practices, high prevalence of diseases and low genetic potential of the stock (Magwisha *et al*., 2002; Rosa dos Anjos, 2005; Lwelamira, 2012). In response to these challenges, a total of 31 interventions to have been implemented in 31 villages in Bariadi and Maswa Districts in Tanzania to improve poultry productivity and marketing for the purpose of increasing household income and welfare among rural households since 2009. This project was sponsored by Tanzania government under District Agricultural Development Plans (DADPs) in close collaboration with, Tanzania Society of Agricultural Extension and Education as the lead partner, Oxfam, District Councils through the District Contact person and Ward Agricultural and Livestock Extension Officers (Oxfam, 2009). However, since the inception of this project, scant information exists on the performance of the program in meeting its objectives. Therefore, this study sought to (i) compare productivity of chicken enterprise before and after interventions among project beneficiaries in three selected villages in Bariadi district (ii) assess the contribution of project interventions on household income and wellbeing and (iii) examine the challenges facing poultry farmers in the in study areas.

2. Study Area and Methodology

This study was carried out in three randomly chosen villages from three wards (Bumera, Luguru and Sakwe) with one village from each ward in Bariadi district in Shinyanya region, in areas where the poultry project was implemented. The villages included

Bumera, Inalo and Mwangimu. The district is located between latitudes 2°15' and 3°10' South of equator and longitude 33°40' to 35°10' East of GMT. The Sukuma constitute the main ethnic group in the area and both crop cultivation and livestock keeping are the major economic activities.

The study adopted a cross- sectional survey in three villages involving 90 randomly selected households (with equal number of households from each village) in June 2012. The sample size was determined based on the formula proposed by Yamane (1967) by assuming 95% level of confidence in estimation. Furthermore, three Focus Group Discussions (FGDs) involving five to ten individuals, as well as in-depth interviews with 11key informants (i.e. project staff, extension officers, ward and village officials) were also carried to supplement information from questionnaires, collected through face-to-face interviews with household heads.Data were analyzed using Statistical Packages for Social Sciences version 16. The software was further used for inferential statistical analysis using t- test and Chi-square test to compare performance of poultry enterprise before and after intervention on various parameters under study and household income. Content analysis was used to analyze qualitative data from the FGDs.

3. Results and Discussion

3.1 Socio-demographic Characteristics of Respondents

Results in Table 1 indicate that most respondents (66.7%) were aged between 35 – 64 years. The overwhelming majorities (83.3%) were married and more than 80% had a household size of at least 6 individuals. These findings indicate that most of the respondents were of medium age, had large families and hence having family responsibilities, therefore, needed to engage in productive activities, such as poultry keeping sustaining their households. Studies have indicated that majority of households in African countries prefer keeping local chicken among others as a quick source of cash for meeting household needs (Asegdom, 2007; Natukunda *et al*., 2011).

Furthermore, large household size in the study area could also imply good supply of labor to engage in productive activities such as poultry keeping. It is also evident from the findings that more than half of the respondents (55.6%) were females, implying that poultry keeping in the study area is a predominantly a female activity. Therefore, putting emphasis on improving productivity of local chicken would improve income and status of most of women, in which majority of them are usually poor compared to men as has been noted in other studies (Ochieng *et al*., 2011).

Table 1: Socio- demographic characteristics of respondents (n = 90)

Variable	Frequency	Percent
Age (Years)		
< 35	23	25.6
35 -64	60	66.7
64+	7	7.8
Sex		
Male	40	44.4
Female	50	55.6
Marital status		
Married	75	83.3
Single	4	4.5
Others	11	12.2
Education level		
None	11	12.2
Primary	66	73.3
Secondary and above	13	14.4
Household size		
Less than 6	12	13.3
6 -10	61	67.8
Above 10	17	18.9

3.2 Information Related to Chicken Husbandry

As a result of the project interventions in the study area, all respondents indicated to have crossbred chicken of Plymouth Rock and Local chicken following supply of Plymouth Rock

Cockreals by the project. The results further indicated that all farmers were keeping their chickens under semi-intensive management. All farmers supplemented their chickens to improve chicken nutrition, and they had shelters and fenced backyards for chickens.. These include vaccination against Newcastle Disease and Fowl Pox, the major viral poultry diseases under smallholder conditions in tropics (Lwelamira, 2007). These interventions were achieved through training farmers and supplying vaccines. Majority of the study participants (92%) also indicated to have received training on chicken husbandry, and had much appreciation on the training as one of the female beneficiaries stated:

"I thank Oxfam for the training, which has already changed our mind-sets and the way of doing things. In the past, I never thought that local chickens could be of such benefits to me."

3.3 Chicken Productivity Before and After Interventions

To determine whether chicken management interventions improved productivity, flock size (number of birds) per household, growth rate (proxied by age to market weight), egg production and chicken mortalities were compared among study participants before and after interventions.

3.3.1 Flock size

Results from Table 2 show significant improvement in average flock size per household after intervention for most of chicken categories. The average number of chicks per household increased from 10 to 42 ($t = 16.0$, $p < 0.001$); pullets from 3 to 13 ($t = 13.1$, $p < 0.001$); cockreals from 4 to 11 ($t = 10.5$, $p < 0.001$), cocks from 2 to 4 ($t = 7.8$, $p < 0.001$), hens from 4 to 9 ($t = 8.3$, $p < 0.001$). Overall, average flock size per household increased from 23 birds to 80 birds ($t = 15.8$, $p<0.001$). Increased flock size increases number of birds for selling and home consumption. Current average flock size in the study area is substantially higher than what has been reported in the literature, which is between 5 and 30 birds (Msoffe, 2003; Gueye, 2003; Munyasi *et al*., 2003) under free-range management system.

Table 2: Number (Mean + S.D) of chicken per household per year before and after intervention

Chicken category	Before	After	$\|t\|$ - value
Chick	10.2 ± 6.7	41.9 ± 17.5	16.0***
Pullet	3.2 ± 2.1	12.5 ± 6.4	13.1***
Cockreal	4.2 ± 2.9	11.1 ± 5.5	10.5***
Cock	1.7 ± 1.4	4.2 ± 2.7	7.8***
Hen	3.8 ± 2.6	8.5 ± 4.7	8.3***
Total	22.9 ±14.7	80.4 ± 31.2	15.8***

S.D = Standard Deviation; *** =Significant at (p<0.001)

3.3.2 Growth rate

The findings of this study also revealed significant improvement in growth rate of chickens following interventions by the program as assessed based on the age to attain the market weight that is at least 1.5 kg (Pedersen, 2002). A notable proportion of farmers (41.3%) indicated that before interventions, chickens were reaching market weight for at least the age 8 months (Table 3). After interventions, few farmers (15.6%) had their chickens reaching market weight for the same period. More than one-third of the farmers (38.9%) reported that chickens reached the market weight at the age of not more than six months following interventions compared to only 17.2% of farmers before interventions ($\chi^2 = 23.07$, $p< 0.001$)

This trend indicates improvement in growth rate of chickens following interventions. Overall, average age to market weight (Mean ± SD) before interventions was 7.5 ± 1.8 months, which was significantly higher than the average of 6.4 ± 1.4 after interventions (t = 4.58, $p< 0.01$) (Table 3). This indicates that chickens reached the market weight earlier during intervention period compared to the period before intervention, which could be seen as a positive impact of the project with regard to chicken growth. Increased growth in chickens is critical for reduced production costs including health services, feeding and labour charges. Improved growth rate of chickens following some technical interventions such as feeding, disease control and keeping improved chickens (i.e. crossbreds) have also been reported in other studies in Africa (e.g. Kondombo *et al*., 2005; Ochieng *et al.,* 2011; Justus *et al*., 2013).

3.3.3 Egg production

To asses if there was improvement in egg production following interventions, respondents were asked to indicate average number of eggs per hen per year for their chickens before and after joining the project. As it was observed that egg production improved significantly following interventions ($p < 0.001$). Before interventions egg production per hen per year by majority of respondents, (55.6%) was less than 60 eggs with a mean of 56 eggs. However, after interventions, most respondents (44.4%) had egg production per hen per year of more than 70 eggs with a mean of 82 eggs (Table 3). Studies have indicated that a local chicken lays 20 - 50 eggs per year under extensive management (Boki, 2000; Gueye, 2003), a production level that is substantially lower than what has been observed in the current study. In line with the results of our study, Iqbal and Pampori (2008) reported high egg production of 75 – 90 eggs per hen per year for Indian chickens following improved managerial conditions involving feeding, housing and disease control.

Table 3: Age to attain market weight and egg production before and after interventions (n = 90)

Variable	Before	After	Test statistic
Age to reach market weight (months)			
6 months and lower	16(17.2%)	35 (38.9%)	
7 months	34(36.6%)	41(45.6%)	$\chi^2 = 23.07^{**}$
8 months	33 (35.5%)	9(10.0%)	
More than 8 months	10(10.8%)	5(5.6%)	
Mean ± SD	7.5 ± 1.8	6.4 ± 1.4	$t = 4.58^{**}$
Number of eggs per hen per year			
Less than 60 eggs	50 (55.6%)	16(17.8%)	$\chi^2 = 33.17^{**}$
60 – 70 eggs	28 (31.1%)	34 (37.8%)	
More than 70 eggs	12 (13.3%)	40(44.4%)	
Mean ± SD	56.3 ± 14.0	82.1 ± 11.2	$t = 13.65^{**}$

SD = Standard Deviation; ** = Significant at $p < 0.01$; *** = Significant at $p < 0.001$

3.3.4 Chicken mortality

High survival rate of chickens is an important attribute for increased output and profit from poultry enterprise. High survival rates ensure substantial number of birds reach the marketing age, and presence of the replacement stock

(Kondombo *et al*., 2005). Results in Table 4 indicate that average chicken mortality rate before intervention was high ranging from 35 – 84%, depending on chicken age/category. In-depth interviews with extension officers and FGDs with project beneficiaries revealed that before interventions, diseases were the major cause of chicken mortality in the area. However, it can be learnt from the findings in Table 4 that there was significant reduction in chicken mortalities following improved husbandry practices that resulted from project intervention. On average, mortality rate dropped from 84.4% to 21.6% (t = 28.10, $p< 0.001$); 51.2% to 11.4% (t = 29.39, $p< 0.001$); 44.9% to 9.6% (t = 24.64, $p< 0.001$); 35.1% to 6.9% (t = 26.13, $p< 0.001$); and 43.4% to 10.7% for chick, pullet, cockreal, cock and hen, respectively.

Table 4: Mortality rate (%) before and after interventions (Mean ± SD)

Chicken category	Before	After	$\|t\|$ - value
Chick	84.4 ± 15.3	21.6 ± 10.9	28.10***
Pullet	51.2 ± 10.9	11.4 ± 6.8	29.39***
Cockreal	44.9 ± 11.4	9.6 ± 7.4	24.64***
Cock	35.1 ± 8.7	6 .9 ± 5.4	26.13***
Hen	43.4 ± 10.1	10.7± 5.3	27.19***

SD = Standard Deviation; *** =Significant at ($p<0.001$)

3.4 Effect of Technical Interventions on Chicken Productivity and Household Welfare

One of the objectives of the project interventions was to increase chicken productivity and household income and the wellbeing of farmers (Oxfam, 2009). The results in Table 5 indicate that the number of chicken sold per household per year, increased from an average of eight birds before interventions to 50 birds after interventions. The results clearly indicate that controlling predators and diseases results into significant increase in flock size. Similarly, the number of eggs increased from an average of 32 eggs to 103 eggs. These increments led into increased household income from chicken

enterprise from TZS 50,170 per year before interventions to TZS 426, 240 per year after intervention. This observation further demonstrates a positive impact of the project.

Table 5: Mean number of birds (± SD) sold and income from chicken per household per year

Variable	Before Intervention	After Intervention	$\|t\|$ - value
Number of birds sold per household year	8.3 ± 5.4	50.4 ± 34.2	11.53***
Number of eggs sold per household per year	32.4 ± 21.2	102.6 ± 52.1	10.84***
Income from chicken enterprise per household per year (TZS)	50,170 ±24,033	426,240 ± 129,000	26.76***

SD = Standard Deviation; *** =Significant at (p<0.001)

Increment in household income after interventions was also confirmed during FGDs. The following quotes from participants of FGDs illustrate:

*"Before I joined the project, I hardly achieved a flock size of 50 chickens. However, after interventions, I managed to increase a flock size of around 140 chickens. Last year Iearned a total of more than TZS 400,000 per year from selling live birds and eggs compared to around TZS 50,000 per year before the project." (*A 46 years old female from Inalo village*).*

Another FGD participant in Bumera village, a male aged 52 years old had the following to say:

"*Although I had more than 15 years keeping local chicken, I was able to sell only an average of 20 live birds and 60 eggs per year. However, after adopting improved interventions, I managed to sell over 80 live birds of different ages per year and more than 200 eggs earning a total of more than TZS 500, 000 in the year 2011."*

In this study, respondents were also asked to indicate benefits they experienced after joining the project. More than 80% of respondents reported improved food security, improved ability to meet other household needs and paying for social services after joining the project (Table 6). Furthermore, more than half of respondents indicated to have managed to get money to start or expand business, including shops (64%), buying other types of livestock

(52%) and buying agricultural inputs (76%) after joining the project. In addition, some respondents also managed to buy new land (36%), transport facilities (30%) while 22%managed to build new houses from the chicken project (Table 6).

Table 6: Benefits from chicken enterprise after joining the project as perceived by respondents (n = 90)

Benefit*	Frequency	Percent
Improved food security/nutrition	88	97.8
Improved ability to meet other household needs (e.g. clothes, furniture)	83	92.2
Improved ability to pay for social services (e.g. school fees & health costs)	73	81.1
Got capital for starting/expanding business	58	64.4
Got capital for starting/increasing number of other types of livestock	47	52.2
Got money for buying agricultural inputs	68	75.6
Bought transport facilities (e.g.. water carrying trolley, bicycle, oxen cart)	27	30.0
Built house	20	22.2
Bought land, expanded farm land	32	35.6

* Based on multiple responses

The FGDs with project beneficiearies also revealed a number of benefits to farmers after joining the project. For example, a 42 years old married woman from Mwangimu village had the following to say:

> "*Last week, I managed to sell 50 chickens earning a total of TZS 350, 000, the money which helped me to pay school fee for my child who is in secondary school form two. Before joining the project, I depended on selling crops and involving myself in casual labor in which I earned very low. As a result we did not have enough to eat and could not buy clothes for my family."*

3.5 Challenges Facing Project Beneficiaries in Chicken Productionand Marketing

In this study, the challenges facing project beneficiaries were also assessed. The results in Table 7 indicate that parasites and diseases, high prices of some feed ingredients, and low price of produce were the leading challenges mentioned by at least three-quarters of total respondents. Other challenges include lack of capital, thieves and predators as reported by 61%, 26% and

32% of the respondents, respectively. It was established from the FGDs and in-depth interviews that the major diseases in the area included Newcastle, Fowl typhoid, Infectious Coryza, and Fowl pox, accounting for over 80% of total mortalities. However, their severity reduced substantially following interventions. Newcastle disease has been reported in many studies to be the major disease challenge for village chickens (e.g. Wambura, 2011; Natukunda *et al*., 2011). Regarding feed ingredients, the major scarce feed ingredients were fishmeal and maize bran, which were obtained at high prices. This observation suggests the need to look for alternative cheap sources of animal protein and energy for chicken supplementation in the area. It was further established that whereas, the project has tried to build market sheds for chicken collection and selling, farmers were still complaining on low prices of produce and lack of market information.

Table 7: Challenges facing project beneficiaries in chicken farming (n = 90)

Challenge*	Frequency	Percent
Parasite and diseases	77	85.5
High prices of some feed ingredients	68	75.5
Low prices of chicken and eggs	72	80.0
Lack of capital	55	61.1
Thieves	23	25.5
Predators	29	32.2

*Data were based on multiple responses

The challenges facing project participants indicated above also featured during FGDs. For example, regarding high prices of some feed ingredients, the following quote from one FGD participant, a 58 years old woman from Inalo village illustrates

"We suffer from shortage of chicken feed ingredients such as fish meal and maize bran which are not readily available in our area. This is mainly attributed to lack of agro-processing machines."

Regarding poor market for the produce, a 48 years old female from Bumera village had the following to say:

"Although the production level of local chickens in area has improved following project interventions, and

construction of market shed for chicken has been done by the project, we still lack market information for potential customers outside the area. We rely on local market which has low prices. In addition, high supply of chicken and eggs in the area as a result of increased productivity has lowered prices. Therefore, responsible authorities should help us in looking for alternative markets for chickens and eggs."

4. Conclusion and Recommendations

The findings of this study have shown that the project has significantly contributed to improving chicken productivity in terms of increased flock size, growth rate, egg production and reduced chicken mortalities. In turn, increased productivity has led to increased household income, assets, ability to meet basic household needs and social services, which could be seen as a positive impact of the project. However, farmers in the study area were still facing a number of challenges. These include parasite and diseases, scarcity of some feed ingredients such as fish meal and maize bran, low price of produce, lack of capital, and thieves and predators. Based on these findings, it is recommended that similar projects should be launched in other parts of the country to improve living conditions of smallholder farmers. Furthermore, efforts to control chicken diseases should be continued and up scaled beyond the project area. Through extension services, emphasis should also be placed on promotion of the use of alternative and cheap feeding ingredients such as blood meal to reduce feed costs. In addition, micro-credits to poultry keepers coupled with collective marketing strategy would stimulate chicken farming and improve household income and welfare of small-scale farmers.

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