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Piloting a Technology Transfer Model: A Case of the UNZA ATDC promoting village chicken production among small holder farmers in Luanshya District of Zambia

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ABSTRACT
Agricultural technology transfer plays a critical role in enhancing agricultural productivity for smallholder farmers. The Agricultural Technology Demonstration Centre (ATDC) of the University of Zambia piloted a project on a technology transfer model for the village chicken technology and demonstrated the role of a university in technology transfer. An Industry Strategic Plan for the village chicken value chain formed the strategic entry mechanism. A technology transfer model comprising 4 stages was applied in the study. Data collected included the number of farmers, the number of chickens reared and marketed, dress weight, gross margins, and the total number of farmers that adopted best practices. A total of 423 farmers (68.3% female and 31.7% males) were in the project area with 195 (68.2% female and 31.8% males) rearing chickens. Chickens from the 1st batch to the 4th batch increased from 2196 to 2646 birds. Marketed birds increased from 1442 to 1728 from the 1st batch to the 3rd batch. Numbers dropped in the 4th batch due to COVID-19-related challenges. The average bird weight marketed was 2.5 kg, 2.6 kg, 2.63 kg, and 2.5 kg, in respective batches. Higher selling weights were obtained within a period of three months compared to six months when the traditional production system was applied. Gross Margin analysis revealed the best option (37%) for farmers was to hold the birds for three months under an improved production system (feed, vaccination, and medicines). More farmers adopted improved husbandry practices which included feed, vaccination, and medication than other technology packages. The development and employment of a definite strategy (the Industry Strategic Plan and the 4-Step Technology Transfer Model) and mechanism (the Centre in conjunction with the Ministry of Fisheries and Livestock as the hub to coordinate and monitor transfer process) by the University of Zambia ATDC proved effective and efficient in the management of the transfer of the village chicken technology which in turn improved the productivity of farmers.

Key Words: Kuroiler birds, 4-Step TTM, Industry Strategic Plan, Village Chicken Value Chain, Zambia

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RÉSUMÉ
Le transfert de technologie agricole joue un rôle essentiel dans l'amélioration de la productivité agricole des petits exploitants. Le mode de transfert de la technologie influence considérablement l'adoption de la technologie. Le Centre de Démonstration de Technologies Agricoles (ATDC) de l'Université de Zambie, à travers un projet financé, a testé un modèle de transfert technologique pour la technologie des poulets de village et démontré le rôle que l'université peut jouer dans le transfert de technologie. Un mécanisme d'entrée stratégique a été conçu par le biais d'un plan stratégique industriel pour la chaîne de valeur des poulets de village, identifiant les lacunes clés, l'accès aux intrants, l'accès à l'information et l'accès aux marchés, afin de garantir la croissance du secteur. Un modèle spécifique de transfert technologique composé de 4 étapes a été appliqué dans l'étude pilote. Les données collectées sur le site pilote comprenaient le nombre d'agriculteurs, le nombre de poulets élevés et commercialisés, le poids de carcasse, les marges brutes et le nombre total d'agriculteurs ayant adopté les meilleures pratiques. Un total de 423 agriculteurs (68,3 % femmes et 31,7 % hommes) ont participé au projet, avec 195 (68,2 % femmes et 31,8 % hommes) disposant d'enclos pour poulets. Le nombre de poulets élevés est passé de 2 196 à 2 646 oiseaux entre le 1er et le 4e lot. Les oiseaux commercialisés sont passés de 1 442 à 1 728 entre le 1er et le 3e lot. Les chiffres ont chuté au 4e lot en raison des défis liés au Covid-19. Le poids moyen des oiseaux commercialisés était de 2,5 kg, 2,6 kg, 2,63 kg et 2,5 kg, respectivement. Des poids de vente plus élevés ont été obtenus en trois mois comparativement aux six mois dans le système traditionnel. L'analyse des marges brutes a révélé que la meilleure option (37 %) pour les agriculteurs était de garder les oiseaux pendant trois mois dans un système de production amélioré (alimentation, vaccination et médicaments). Plus d'agriculteurs ont adopté des pratiques d'élevage améliorées telles que l'alimentation, la vaccination et la médication que d'autres paquets technologiques. Le développement et l'emploi d'une stratégie définie (Plan Stratégique Industriel et Modèle de Transfert Technologique en 4 étapes) et d'un mécanisme (le Centre, en collaboration avec le Ministère des Pêches et de l'Élevage, comme pôle de coordination et de suivi du processus de transfert) par l'ATDC de l'Université de Zambie se sont avérés efficaces pour gérer le transfert de la technologie des poulets de village, améliorant ainsi la productivité des agriculteurs.

Mots clés : Poulets Kuroiler, Modèle TTM en 4 étapes, Plan Stratégique Industriel, Chaîne de Valeur des Poulets de Village, Zambie

INTRODUCTION

Technology as defined by Kumar *et al* (1999) is an important input in the developmental process and its role and importance has been recognized over a long period with specific examples being given on impact (Mgendi *et al*., 2016). Agricultural technologies are developed from an array of institutions which include, but not limited to, research organizations and universities (Rani *et al*., 2018). The impact of these technologies on the livelihoods of farming communities depend on a variety of factors influencing/enhancing adoption (Parvan, 2011; Ahmed, 2004). During the development phases of these technologies the general principles of on-farm experimentation have been followed so that the developed technologies are suitable and relevant for the target farming communities (Belshaw, 1979; Cook *et al*., 2013; Mgendi *et al*., 2016). Once the technologies are developed, the manner in which they are finally taken to the farming communities or the end users for application/utilization plays a major role in the adoption of the technologies. Lado (1998) lamented as to why despite several improved technologies being available from several sources their impact is limited at farmers' level. This calls for the need for searching and adopting appropriate technology transfer models and mechanisms that examine the continuum from research, through development and dissemination to utilization of an agricultural technology. The authors' further advocate for the need to involve the beneficiaries whose intimate (indigenous) knowledge is critical for the impacting effect of the technology. Evidence from several studies have shown that, unfortunately, the outcome of this linear model rarely meet the desired result of adoption of technology due to among others institutional factors like policy, research organization management, staffing, or logistical support for field operations (Merrill-Sands *et al*., 1989; Knickel *et al.*, 2009; Chave *et al*., 2012; Aerni *et al*., 2015; Berthet *et a*l., 2018).

Several models of technology transfer have been studied and critical elements of effectiveness suggested and a clearly formulated strategy and developed mechanism was highlighted as important ((Rani *et al* 2021). Technology transfer has been a subject of concern in agriculture for a long time and various models have been tested with varying degree of success. The need to adopt an appropriate model is informed by the specificity of technology and indeed preferred mechanism. Odong *et al*. (2022) pointed out that there is need for universities in developing countries to be more responsive to the development needs of local communities and society at large and this underscores the motivation that guided the University of Zambia Agricultural Technology Demonstration Centre (UNZA-ATDC) to embark on this study. The development of the Industry Strategic Plan (ISPby the Centre constituted a critical step in developing both the strategy and mechanism for enhancing effectiveness and efficiency in the technology transfer agenda. The current study aimed at demonstrating the deployment of a technology transfer model for the village chicken technology underpinned by a defined strategy from an Industry Strategy Plan (ISP). The study recognized physical components (Products, Tooling, Equipment, Techniques, and Processes) and informational components (Management, Marketing, Production Quality control) as premises for intervention to address the institutional barriers. The study also illustrates the role that a university can play in the technology transfer process by establishing a strategy and a mechanism of effectively transferring a technology to farming communities thereby furthering development and commercialization of the technology. This paper presents the results from piloting a specific technology transfer model for village chickens in Zambia.

METHODOLOGY

Formulation of the Strategy and Identification of the Technology: The identification of the village chicken as a target agricultural technology was arrived through a detailed Industry Strategic Plan (ISP) that identified the priority interventions with high potential to achieve the overall objectives, i.e., strengthen the enabling environment and ultimately the growth of the village chicken industry in Zambia. The ISP further defined the role that the UNZA/ATDC can play in strengthening the village chicken value chain productivity and provided options on buy-in and ownership among key stakeholders to the shared vision and strategy for the purpose of commercialization.

Industry Strategic Plan. The ISP was carried with the key objectives of determining the technology that had the best set of parameters for the piloting study. The formulation of the Plan for the village chicken was preceded by an assessment of various value chains, within animal and plant/crop domains and these included goats, pigs, dairy animals, village chickens, vegetable production and maize production. The criteria used for the assessment were:

1. Potential Smallholder Reach: how easily would smallholder farmers access the technology?
2. Cost Reducing Potential: cost effectiveness of the technology based on gross margins
3. Revenue Generation Potential: profitability of the undertaking

The results from this initial assessment showed that the village chicken value chain was the most favourable. The participation of female farmers in the village chicken value chain was particularly striking with the potential to economically empower females in the farming communities.

Village Chicken Value Chain Industry Strategic Plan Development Process. The ISP for the village chicken value chain was carried with the following objectives:

1. Identifying priority interventions with high potential to achieve the overall objectives, i.e., strengthen the enabling environment

and ultimately the growth of the village chicken industry in Zambia
2. Developing a framework for shared vision and strategy among key stakeholders to promote buy-in and ownership the value chain nodes

3. Identifying key levers of growth

4. Articulating the role of the ATDC in strengthening the village chicken value chain, as well as future value chains

The formulation process was guided by the following hypotheses:
1. There is significant unmet demand for village chicken from consumers
2. Smallholder farmers (SHFs) have the potential to fill the demand gap, but the value chain is informal and SHFs lack linkages to the market
3. A 25-30% increase in village chicken production would stimulate growth in the industry
4. Growth in village chicken industry will benefit from a well laid out strategy and mechanism for technology transfer

This component of the Study was carried out by a team of staff from UNZA/ATDC and Techno Serve supervised by a Value Chain Specialist. It involved visiting selected provinces (Southern, Copperbelt and Lusaka. **Figure. 1** and districts (Kalomo, Batoka, Monze, Mazabuka, Chilanga, Chongwe, Lusaka, Luanshya and Masaiti) where village chickens are a major business and interviewing current and potential stakeholders including Poultry Association of Zambia (PAZ), Ministry of Agriculture, Ministry of Fisheries and Livestock, and Key Private players,). The sampling frame used involved all farmers/members of each of the cooperatives. This was on the guided assumption that all farmers kept village chickens. A multi-stage sampling approach was adopted as depicted in **Figure 2**. An elaborate structured questionnaire was administered to the cooperative members, complemented by Key Informant Interviews (KIIs) with relevant key stakeholders to get a full understanding of how the value chain was functioning and identify potential stakeholders to partner with. The simplified method of determining sample size for proportions (Yamane, Taro. 1967) was used due to the varying sizes of the cooperatives. For cooperatives with less than 20 members all membership was included in the sample size.

Data collected through the questionnaire was subjected to analysis using SPSS Statistical Software Package V.10. Data obtained was subjected to validation to detect and resolve outlier data points. Descriptive statistics were used to describe the data obtained from the questionnaire. Descriptive statistics were calculated using specific means and the stratification of data during analysis was done by gender, household head, role in the value chain (producer, aggregator, processor and retailing

Ethical and confidentiality issues were considered prior to data collection before interviewing. A consent note was agreed on before any interview. It was assured that whatever was discussed during the interview and the results from the analysis was not going to be disclosed to other people. Indeed if a respondent was not willing to participate no interview was carried out.

Where audio recordings were used advance permission was sought.

ISP Results. The results from the ISP development process pointed to a significant unmet demand for village chicken, particularly from urban non-producer consumers. This demand was particularly concentrated in urban non-producer consumers (e.g., white/blue collar workers in towns), who did not have access to village chicken in typical retail channels, such as supermarkets and grocery stores. The limited access to village chicken in supermarkets and the high retail prices quoted when available constituted key barriers. It was noted that the village chicken value chain was very informal, and lacked critical linkages between SHF supply and market demand. Most of the SHFs raised both indigenous Zambian breeds and foreign breeds pointing to a need for additional research on the characteristics of a "true" village chicken and its various breeds/strains.

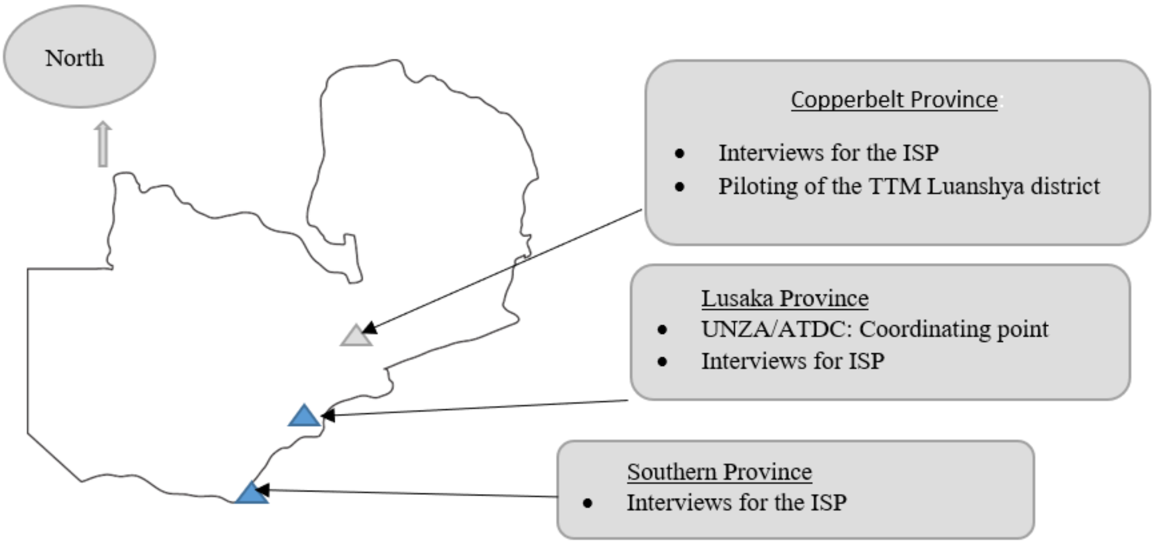

Figure 1. Locations of the Interviews and Piloting of TTM

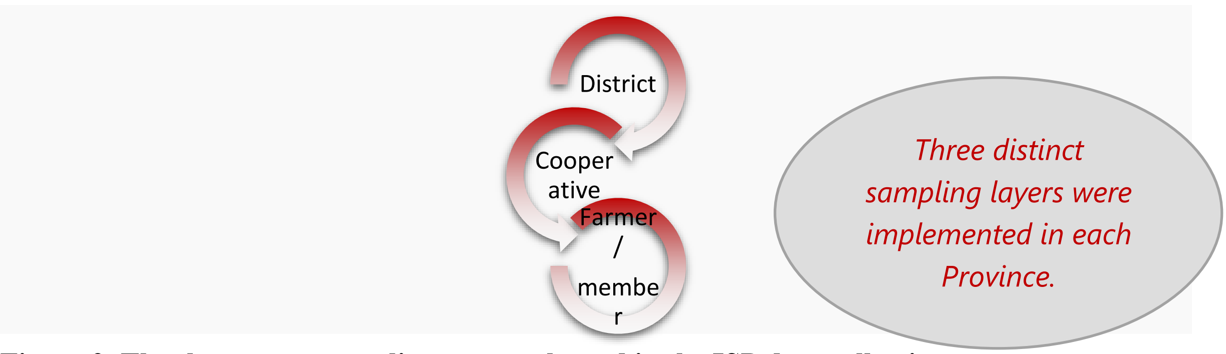

Figure 2. The three-stage sampling approach used in the ISP data collection

The profitability of raising village chickens depended on the amount of supplemental feed that SHFs provided; at current market prices and levels of supplemental feeding, village chickens were significantly more profitable than broilers

The most significant challenges in the village chicken value chain were mainly:

- Limited SHF access to markets: SHFs did not produce at sufficient scale to access markets directly, and also lacked information on market demand and prices, resulting in disincentives to increase flock sizes

- Limited access to information: SHFs' current limited information on vaccination options, and
b. need for a viable aggregation model,
c. A need for an effective network of processing and retail outlets,

proper regimes, enabled diseases like Newcastle to kill 80-90% of chickens in a flock each year. Lack of education about best practices in production also limited SHFs' ability to raise chickens effectively

- Limited access to inputs: SHFs did not have easy access to key inputs such as vaccines, effectivesupplementalfeed,effective/affordable housing, among others

- Further the ISP identified other key levers of growth as follows:

a. A

d. Knowledge on industry standards for products

e. A need for an effective industry-research collaboration to address emerging technical challenges

Piloting the TTM. The piloting of the TTM was carried out with farmers, the Agricultural Technology Demonstration Centre (ATDC) of the University of Zambia, Lusaka serving as the hub for all activities and the Ministry of Fisheries and Livestock staff in Luanshya district. The field work was in Luanshya District of the Copperbelt Provincen Zambia as the main site to pilot the TTM and determine whether the levers for growth presented in the Village Chicken Industry Strategic Plan would transform the village chicken value chain. Luanshya was selected on the basis of having the following characteristics:

1. Large number of Small Holder Farmers (SHFs) already producing village chicken for the market.
2. Good potential to produce for the market.
3. Local SHFs understood farming practices for business and had previous experience using aggregation systems.
4. Presence and expressed interest by a local off-taker (a key player in the aggregation process) to purchase the birds from the farmers and process them for the retail market

Eight cooperatives from five Veterinary Camps were engaged to develop Demonstration Farms, as nodes of activities in the farming community through which the technology transfer model using the village chicken as the selected technology was piloted. In total 24 Multipurpose Cooperative Societies (MCPS) were involved in the project.

Technology Transfer Model piloted. The Technology Transfer Model (TTM) applied was a four-step technology transfer process whose details are below.

Step 1: Identify (test and evaluate): Identify, test, and evaluate relevant technologies based on a deep understanding of female and male SHF needs and value chain dynamics, which have clear scaling pathways, and funding potential. The village chicken Technology was identified from local private sector village chicken (a proxy for village chicken type). The choice of the Kuroiler breed was motivated by the following: through a scan on local indigenous chicken set up. In view of the proven state (improved village type - Kuroiler) of the identified technology the testing and evaluation at the Centre was not necessary in the current study.

Step 2: Demonstrate: Demonstrate commercially-viable technology packages at the ATDC (or other locations such as formal demonstration plots at seed companies) to relevant industry market system participants such as agro-input suppliers and commercial farms. In the current study the demonstration was done on selected farms and considered as Demonstration Farmers. This stage was carried concurrently with the next step, piloting. The strategy in piloting the TTM was to undertake relevant steps in tandem and/or in parallel towards the overall objectives of transferring the technology.

Step 3: Pilot: Pilot technologies via working with local partner companies and NGOs, e.g. in closed-market systems such as out grower and in-grower schemes. At this step, SHFs are trained on how to use the improved technologies and encouraged to take the lead in the testing of the viability during their annual growing/rearing and market cycles. In the current study the SHFs were trained and encouraged to form Farmers' Cooperatives. Data on growth and economic parameters during the piloting were collected as indicated below.

Step 4: Scale-up: Scale-up technology adoption through a broad alliance of local private and public sector partners, including commercialization partners where appropriate – sharing technology packages, training materials, and engaging in "train the trainer" activities; and developing or engaging with a broad spectrum of industry stakeholders through "innovation platforms" village chicken value chains. In the current project the above were initiated for follow up for impact assessment later. It was envisaged that Farmer Cooperatives would be the vehicles for scaling up and scaling out.

Field Pilot Arrangements: The type of bird chosen for the piloting was the Kuroiler cross. The source of the birds was day old chicks from a cross between pure bred Kuroiler cockerels and purebred Kuroiler hens. The type of bird (F1) mimics the

- The breed is closest to the traditional village chicken in terms hardiness related to management: free ranging/scavenging the

birds does enhance its development and growth
- Continuous source of the breed was assured through a defined value chain player throughout the pilot period
- Productivity parameters of the Kuroiler bird (time to maturity, size/weight of mature bird and feed conversion ratios) were economical considering market price
- Market parameters (taste and texture of the meat) were similar to village chickens

On account of the above the Kuroiler was chosen as a proxy for the traditional village chicken that is so heterogeneous that response to management intervention always exhibits variability. It was noted that traditional village chicken has no identity (not genetically fixed). Every batch is different from the next hence to discern a pattern of response to management interventions is difficult if not impossible

Day old chicks were obtained from a commercial farmer who produced Kuroiler birds (Zikulu Nkuku Ltd) and distributed to the farmers through an Anchor farmer. Thereafter, farmers were closely and continuous supported (training and extension services) through the ATDC and the Ministry of Fisheries and Livestock. Linkage to the upstream players, those involved in the processing phase (aggregating, transporting and marketing/retail) of the value chain was a key role that the Project played. This is summarized in Figure 3 below.

Data Collected. Key performance indicators for the pilot site included:

- number of cooperatives recruited taking part in aggregation
- number of farmers that have received technical assistance (male and female)
- number of farmers rearing chickens (male and female)
- number of village chickens reared per batch
- number of village chickens marketed per batch
- Average weight of marketed chicken per batch
- Gross margin %
- number of farmers adopting best practices in village chicken rearing

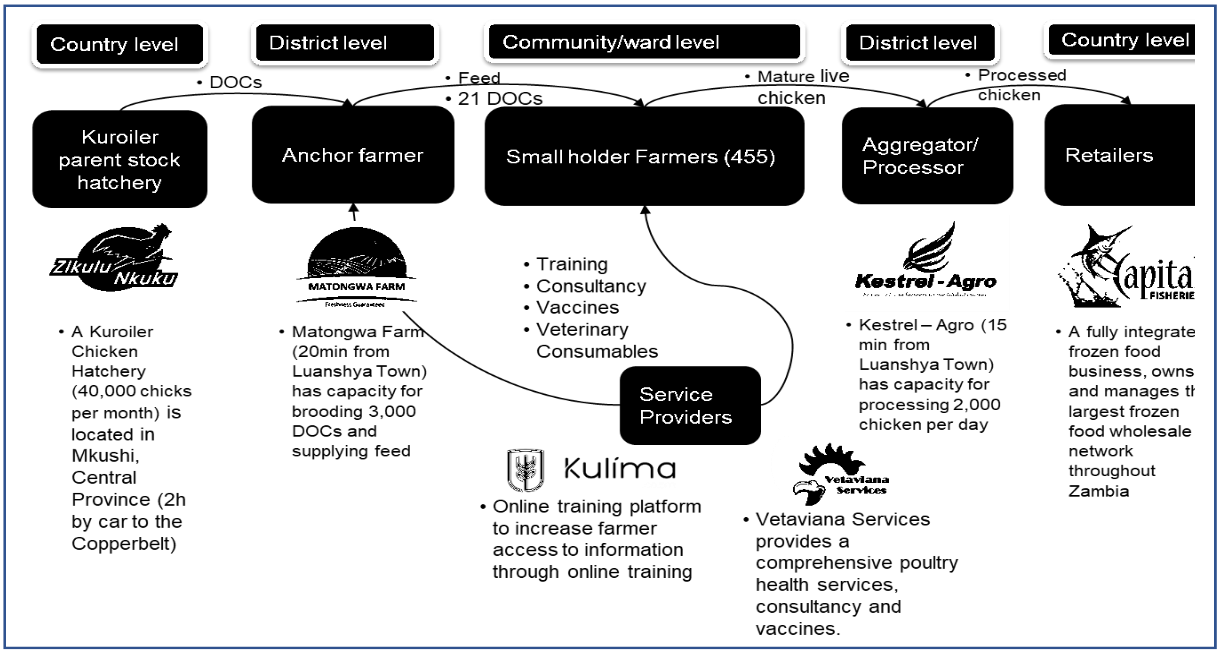

Figure 3. Component Outlay of the Village Chicken Pilot Project in Luanshya District, Zambia

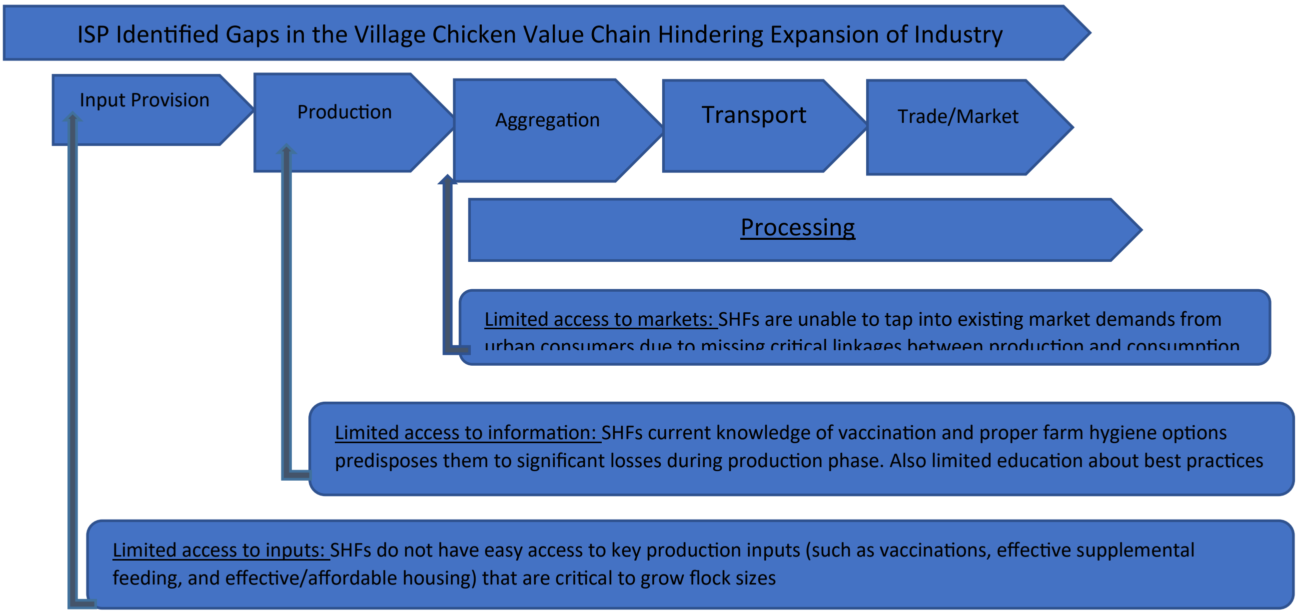

Figure 4. Principal outcomes from the Village Chicken ISP

RESULTS AND DISCUSSION

The Technology Identification process. A detailed Industry Strategic Plan, summarised in Figure 4, revealed key areas of concern along the value chain at input provision, production and aggregation (marketing) stages. This is an important component of the strategy in the transfer process (Figure 3) as it points to the key issues to focus on for effective and efficient technology transfer process as suggested by Rani *et al*. (2018). The piloting exercise in the field therefore focused on addressing/mitigating the challenges. Key growth levers identified from the ISP included the following:

1. **Developed viable aggregation models:** SHFs gain access to output markets through aggregation schemes, which incentivizes increased production and investment in better flock management

2. **Improved access to information:** SHFs receive reliable information on production, markets, and consumer preferences from centralized sources that are updated regularly based on new research; information is distributed in ways tailored to SHFs

3. **Improved access to inputs:** SHFs have access to a broader range of options for key inputs across various distribution networks

4. **Established network of processing facilities:** Broad network of small and mid-size processing facilities enable SHFs/aggregators to supply village chicken to supermarkets and other retail outlets

5. **Established industry standards:** Standards established to define village chicken along entirety of value chain from production to consumption, enabling stakeholders to produce, sell, and buy with assurance

6. **Improved industry collaboration and research:** Further research and knowledge-sharing on village chicken is coordinated across value chain stakeholders on a regular basis: defining one key role of the UNZA/ATDC beyond the coordinating of the activities

Outputs from Field Piloting of the Technology Transfer Model. A total of 24 Farmers' Cooperatives of varying sizes and composition (Figures 5 and 6) were engaged in the study, the largest having membership of 50 and the smallest with membership of three (3). In most of the Cooperatives the dominance of females (solid bars) was evident.

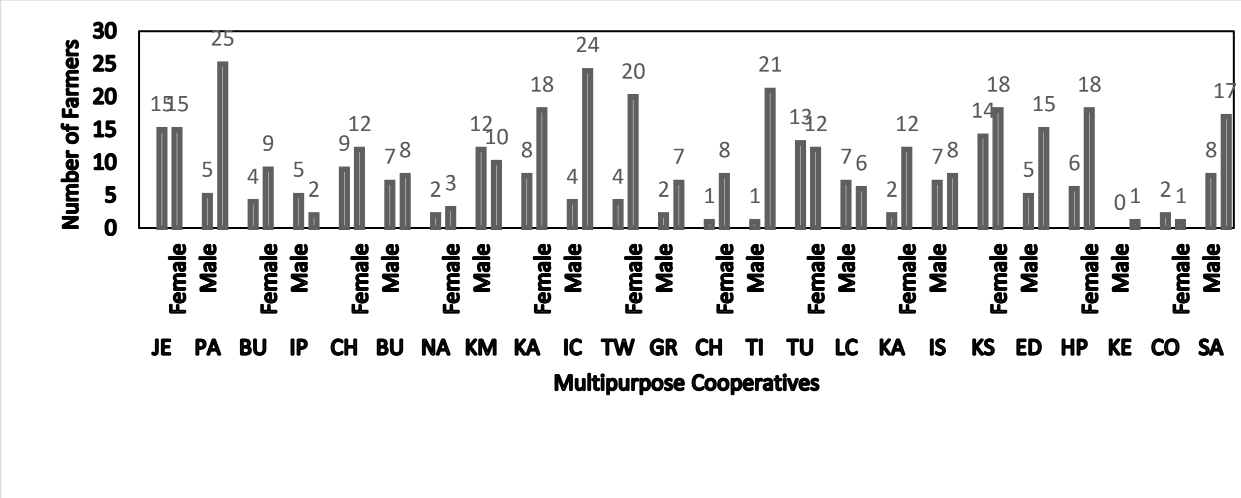

Figure 5. Number of farmers recruited for aggregation

The study revealed that whereas there were some variations in the village chicken production participation, disaggregated by gender (Figure 4), the majority of the participants were females. Of those that were trained, a total of 432, most were females (68%), (Figure 5), and the numbers of those participating in rearing chickens was again dominated by females (69%). In most technology transfer studies male participation is reported dominant and this is related to decision making on issues that would include, but not limited to, access to resources (land, labour, capital, non-farm income, inputs and extension services), educational level, distance to market, decision making power, (participation in associations, norms and beliefs Aduwo *et al*. 2019). Muriithi *et al*., (2017) reported gender neutrality in a study on push and pull technology on maize in Kenya, while Okitoi *et al.* (2007) working on rural poultry noted that ownership and therefore participation in rural poultry enterprise was predominantly by women (63%). The current study agrees with these studies on the dominance of females in poultry production at farm level. Therefore, gender participation in agricultural technology utilization depends on the type of technology.

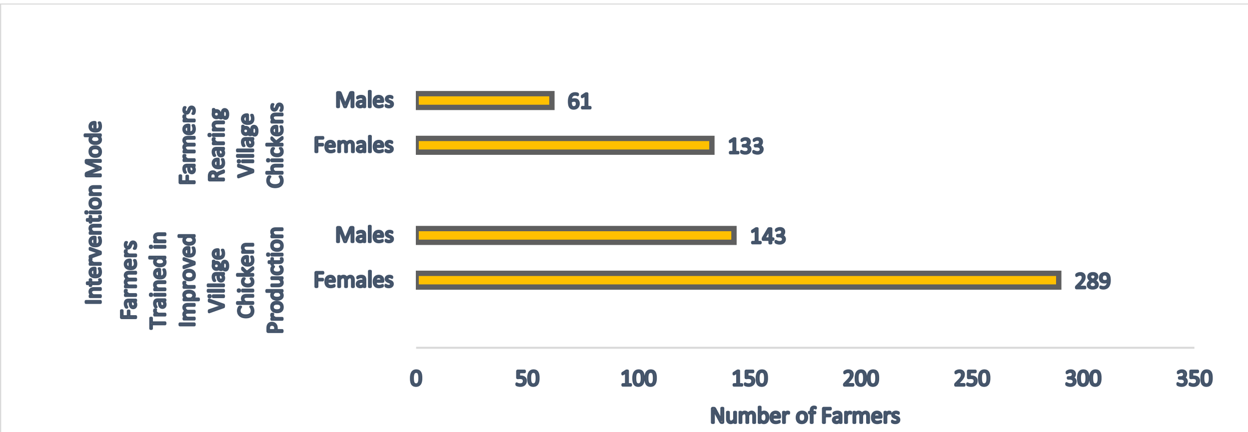

Figure 6. Number of farmers that received technical assistance (male and female) and number of farmers rearing chickens (male and female)

Number of village chickens reared, marketed and selling weight in each batch. The total number of chickens reared in each batch (Figure 7) increased steadily from the start (batch 1) to the end (batch 4). The increase was attributed to the farmers' confidence growing in rearing the Kuroiler birds; indeed, the positive benefits perceived in investing in the technology utilization. Rogers (2003) identified five key factors that influence adoption as relative advantage, compatibility, complexity, triability and observability and stated that the first three were most important. The results of the pilot study suggest that uptake of village chicken production was underpinned by the relative advantage associated with the technology (high demand and therefore quick selling) and the compatibility of the technology to the farmers production systems; indeed, the fact that rearing of chickens is a common farming undertaking in traditional farming communities thus was relatively less complex**.**

Improved Kuroiler birds were superior to the traditional village chickens in regards to selling weight (Table 1) when treated the same (left to scavenge), 1.8 kg versus 1.5 kg selling weight at 6 months and 8 months, respectively. With enhanced adoption of the village chicken technology (informational component in terms of feed, vaccine and medicines) the superiority of the Kuroiler bird is observed having a selling weight of 2.3 kg after only three months! The drop in mortality from 10% to 1.5-2%, the faster weight gain and therefore the higher potential market price are observable benefits that farmers considered in adopting the total technology of village chicken (Kuroiler)

The number of marketed birds also increased from Batch 1 till Batch 3. The drop in numbers in Batch 4 was attributed to the movement challenges that came with the Covid 19 pandemic (Figure 8**).**

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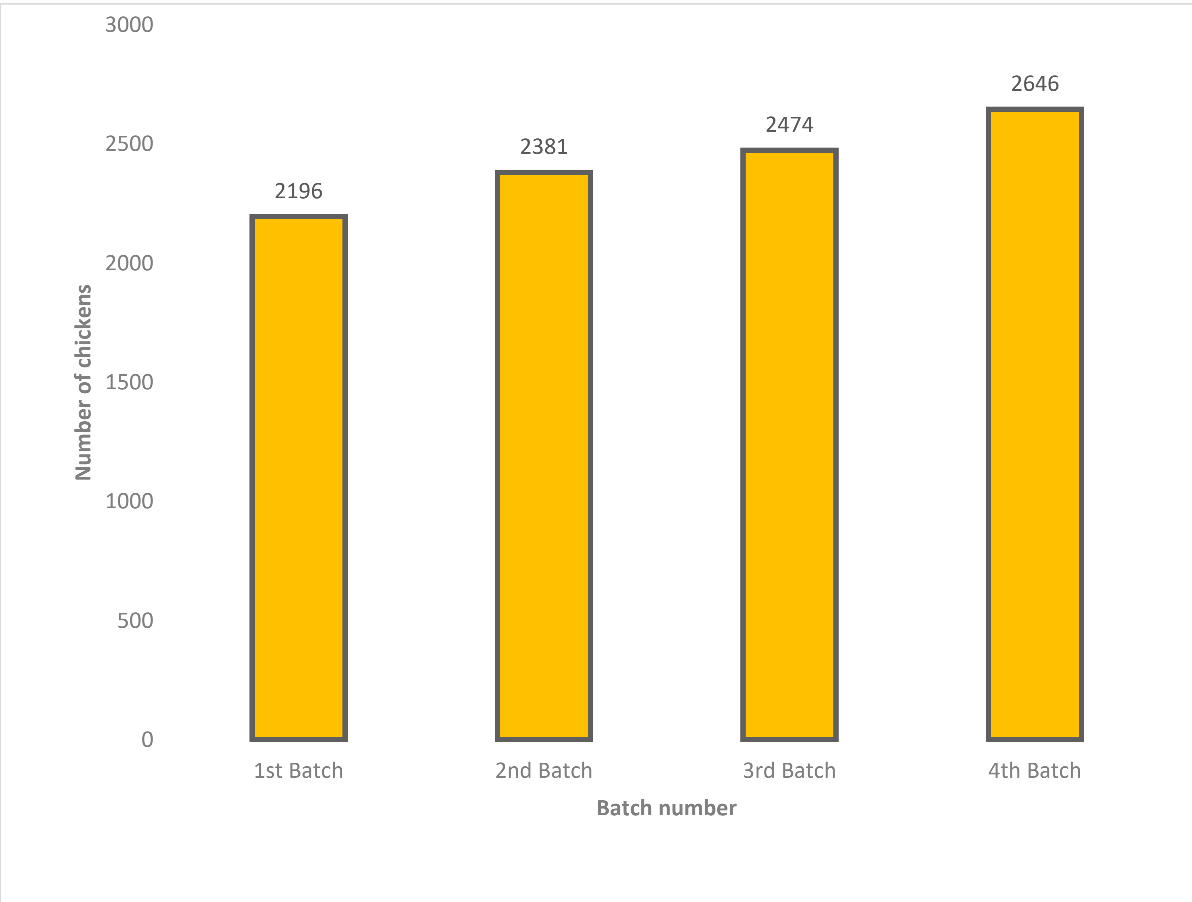

Figure 7. Chicken reared per batch

Figure 8. Number of marketed Birds per Batch

Adoption of the best practices in village chicken rearing. Chicken rearing is an undertaking that has roots in the traditional agricultural setting of most small-scale farmers, forming a hub for several cultural, nutritional and social capital household community needs (Nanyeenya *et al*., 2013). This renders chicken rearing easy to embrace (compatibility) and indeed does not present any difficulties (complexity) as explained by Rogers (2003). The positive benefits perceived in investing and adopting the technology were clearly observed (Table 1 and Fig. 9).

Table 1. Growth parameters of the introduced technology (Kuroiler rearing) and the Gross Margins

	Scavenging indigenous	**Scavenging kuroiler**	**Scavenging kuroiler w/ supplement. feed**	**Scavenging kuroiler w/ vaccine**	**Feed & vaccine w/ supplemented kuroiler**	**Kuroiler commercial**
Flock size (#)	150	150	150	150	150	150
Mortality rate (%)	10.0	10.0	10.0	2.0	1.5	1.0
Weight (kg)	1.5	1.8	2.25	1.8	2.25	3
Maturation period (months)	8	6	3	6	3	3
Revenue (ZMW)	**6,379**	**13,336**	**32,744**	**18,289**	**41,367**	**54,175**
Variable costs (ZMW)	**1,350**	**8,100**	**24,114**	**8,797**	**26,028**	**36,953**
Gross margin (ZMW)	**5,029**	**5,236**	**8,631**	**9,492**	**15,339**	**17,221**
Gross margin (%)	79%	39%	26%	52%	37%	32%
Gross margin/chicken (ZMW)	**55.9**	**12.9**	**12.0**	**23.4**	**21.3**	**23.9**

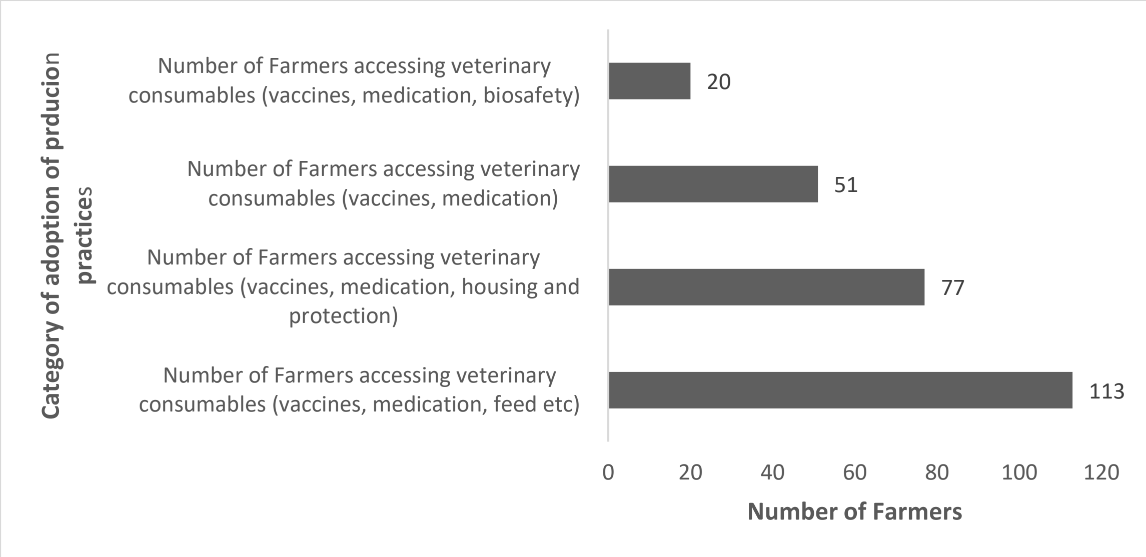

Figure 9. Number of Farmers that adopted Improved Technology

The role of the Agricultural Technology Demonstration Centre. The realization of the limited impact of agricultural technologies, which are abundant from research institutions, on the rural communities has raised concerns over the relevance of agricultural research to socio-economic development. The evident poor/low adoption of the technologies has been identified as the major causal factor. Earlier interventions through donor inspired technology transfer models of the Training and Visit (T&V) and others through line government ministries have pointed to the increase in the quantity of training and visits but little to show on the quality of the technology transfer; indeed, the model was found to be financial unsustainable: an issue related to management strategy (Hussain *et al*., 1994; Anderson *et al*., 2006). Indeed, Odongo *et al,* (2022) observed the need for a defined role of universities in this space, given the highest concentration of scientists dedicated to generating technologies for development.

In this respect the UNZA ATDC developed the ISP as a framework for intervention which provided a clear roadmap on how and what to consider (growth levers) in the entire village chicken value chain to ensure impacting technology transfer. Relevant players along the value chain were engaged emphasizing their roles and responsibilities: key message was that they can derive economic benefits by active participation. This approach enhanced the drive for high adoption of the technology (Figure 3). Capacity building among the farmers and all value chain players was carried out to ensure high absorption capacity of the technology (Figure 6). The selection of key value chain players and the training of farmers constituted the key coordination functions that the ATDC carried out. Rani *et al*. (2018) emphasized the importance of having a strategy and mechanism in technology transfer process. Further the authors point to the fact that technology transfer is not a one-off activity as such it will require reinforcement and training; this a role that the ATDC played adequately since it is closely linked to the Research and Development domain. A timely alert is shared that an "Unsupported technology can fade into obsolescence quickly".

The implementation of the 4-step model entailed effective management of linkages among the players and this was achieved through establishment of Anchor Farmers and consolidating the functions of the Farmers' Cooperatives via management training downstream (Step 3 and 4) and creation of a Village Chicken Park at the ATDC to address issues in the upstream (Step 1 and 2) such as adaptive research on emerging challenges from the field. Merrill-Sands *at el*. (1989) emphasized the importance of management of linkages for effective technology transfer.

CONCLUSIONS

The following are the key conclusions from the project:

1. The effectiveness of the 4-step Technology Transfer Model was demonstrated when a clear roadmap and mechanism of technology transfer guided the process.
2. Economic benefits accrued to the farmers utilizing the improved technology.
3. The village chicken technology, encompassing both the physical and informational components, was highly embraced by farmers.
4. The coordinating role of the University of Zambia ATDC steered strategically the process of technology transfer

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DECLARATION OF NO CONFLICT OF INTEREST

The Authors declare No Conflict of Interest in this paper

REFERENCES

Aduwo, O.E., Aransiola, J.O., Ikuteyijo, L.O., Alao, O. T., Deji, O.F., Ayinde, J.O., Adebooye, O.C. and Oyedele, D.J. 2019. Gender differences in agricultural technology adoption in developing countries: a systematic review. *Acta Hortic*. 1238: 227-238

Aerni, P., Nichterlein, K., Rudgard, S. and Sonnino, A. 2015. Making agricultural innovation systems (AIS) work for development in tropicalcountries. *Sustainability*7(1):831– 850. https://doi.org/10.3390/su7010831

Ahmed. A. 2004. Challenges of agricultural technology transfer and productivity increase in the Sudan *Int. J. Technology, Policy and Management.* 4: 136-150

Belshaw, D. 1979. Taking Indigenous Technology seriously: The Case of Inter-cropping Techniques in East Africa. *IDS* 10: 24-27

Berthet, E. T., Hickey, G. M. and Klerkx, L. 2018. Opening design and innovation processes in agriculture: Insights from design and management sciences and future directions. *Agricultural Systems* 165:111–115. https://doi.org/10.1016/j.agsy.2018.06.004

Chave, M., Ozier-Lafontaine, H. and Noël, Y. 2012. Towards agricultural innovation systems:Designing an operational interface. *Outlook on Agriculture* 41 (2) : 81–86. https:// doi.org/10.5367/oa.2012.0090

Cook, S., Cock, J., Oberthür, T. and Fisher, M. 2013. On Farm Experimentation. *Better Crops*. 4: 17-20

Knickel 2009.Towards a better conceptual frame work for innovation processes in agriculture and rural development: From Linear Models to Systemic Approaches. *The Journal of Agricultural Education and Extension* 15 (2): 131–146. https://doi.org/10.1080/13892240902909064

Kumar, V., Kumar, U. and. Persaud, A. 1999. Building Technological Capability through Importing Technology: The Case of Indonesian Manufacturing Industry. *The Journal of Technology Transfer* 24: 81–96

Lado. C. 1998.The transfer of agricultural technology and the development of small-scale farming in rural Africa: Case studies from Ghana, Sudan, Uganda, Zambia and South Africa. *Geo Journal* 45: 165–176

Mgendi, G., Mao Shiping, M. and Xiang, C.2019 2019. A Review of Agricultural

Technology Transfer in Africa: Lessons from Japan and China Case Projects in Tanzania and Kenya. *Sustainability* 11: 1-19

Merrill-Sands, D., Kaimowitz, D., Sayce, K. and Chater, S. 1989. The Technology Triangle: Linking Farmers, Technology Transfer Agents, and Agricultural Researcher. Published

Muriithi, B., Kassie, M., Diiro, G. and Muricho, G. 2017. Does gender matter in adoption ofsustainable agricultural Technologies? A case of push-pull technology in

Kenya. PEP Policy Brief Volume 169.

Nanyeenya, W N., Mugisha, A., Musinguzi, S.P.,Magambo, R. and Senoga. M. 2013. Constraints, livelihoods and technology adoption of village chicken producers in Uganda. *Livestock Research for Rural Development*. (25):188. http://www.lrrd.org/lrrd25/11/nany25188.htm

Odongo, W., Elolu, S., Akite, I., Ongeng, D. and Kalule, S.W.2022.University-induced innovations for nurturing farm-based micro-enterprises: Experiences from engaging with refugee hosting contexts. *African Journal of Rural Development* 8 (1): 1-17

Okitoi L. O., Ondwasy, H.O., Obali, M.P. and Murekefu.F. 2007: Gender issues in poultry production in rural households of Western Kenya. *Livestock Research for Rural Development*. 19: 17. Retrieved September19, 2022, from http://www.lrrd.org/lrrd19/2/okit19017.htm

Parvan, A. 2011. Agricultural Technology Adoption: Issues for Consideration When Scaling-Up. *The Cornell Policy Review*: 1:1-22

Rani, S.S., Rao, B.M., Ramarao, P. and Kumar, S. 2018. Technology Transfer Models and Mechanisms *International Journal of Mechanical Engineering and Technology* 9: 971–982.

Rani, S.S., Rao, B.M. and Ramarao, P. 2021. Technology Transfer Processes from Indian Public Funded Research and Development Institutions to Industries. *International Journal of Management* 12: 21-39

Rogers, E. M. 2003. Diffusion of Innovations. 5th Edition Free Press New York. 552 pp.

Yamane, T. 1967. Statistics, an Introductory Analysis, 2nd Ed., New York: Harper and Row