

Department of Animal Science

ADDRESSING PRODUCTION CONSTRAINTS TO SMALLHOLDER POULTRY FARMING IN TANZANIA

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In 2020, between 720 million and 811 million people experienced hunger globally (FAO et al., 2021). Food security is a significant global concern today because nearly one in 10 people in the world are affected by chronic malnutrition, with the most severe cases occurring in Africa (Mbuli et al., 2021). In Tanzania, the demand for chicken meat and eggs greatly exceeds domestic production and supply, primarily because of low production and productivity of indigenous chicken breeds and limited availability of quality feed (Naggujja et al., 2020). The demand for poultry meat is expected to increase by 148 percent, while the demand for beef, goat and mutton, pork and milk will increase by 87, 71, 88 and 108 percent, respectively, from the mid-2000s to 2030 (Baker et al., 2016). Poultry production has been constrained by multiple factors in many local communities across Tanzania. Major challenges to poultry production include diseases, limited access to vaccines and vaccine cold chains, feed cost and availability, lack of organized markets for products, lack of Extension services and personnel to assist smallholder poultry farmers (most of which are women), rearing and management issues, predators, theft and parasites. Poultry production in Tanzania is essential to supporting the fast-growing population of the Dodoma region since all government offices have recently moved into that region from Dar es Salaam (Ngongolo and Chota, 2021). As more people shift to the new city in search of employment, business and other official activities, poultry production should increase and attract more youth and women (Hundie et al., 2019; Ngongolo and Chota, 2021) because poultry production is an integral part of smallholder agriculture in the developing world and makes a multidimensional contribution to the livelihood of both rural and urban households (Birhanu et al., 2023).

Tanzania's poultry industry

Tanzania's poultry industry has seen steady growth over the past decade (Wilson et al., 2022). There are several reasons for this increase. Improved dual-purpose chickens have been introduced in various regions of the country in the past decade (Sanka et al., 2020). At the same time, the number of commercial layers and broilers produced under high-input/high-output intensive management systems has continued to grow, particularly in urban areas (Sindiyo et al., 2018; Mushi et al., 2020). One important point here is that high-performance exotic genetic stock

requires a plentiful supply of high-quality feed at all times, and that is a challenge in Tanzania. Finally, policy interventions taken to improve the poultry sector in Tanzania include the genetic improvement of indigenous chickens raised under the low-input free-range scavenging system (Michael et al., 2018). As a result, improved crossbred chickens may be more useful than exotic genetic stock to many smallholder farmers because they have lower nutrient requirements and are more adapted to the climate and alternative feed sources. The recent introduction of improved dual-purpose chickens (Sasso and Kuroiler breeds) has enormous potential because of their high genetic potential and adaptability in semi-scavenging systems (Sanka et al., 2020; Guni et al., 2021).

Poultry farming systems in the developing world are typically organized along an intensification gradient ranging from extensive scavenging backyard flocks to the most intensified and modern modes of production (Chaiban et al., 2020). Agricultural intensification occurs everywhere, but that initial intensification (where production first shifts from subsistence to commercial systems) in smallholder livestock production settings in low- to middle-income countries (LMICs) is poorly understood. What is understood is that poultry constitutes a significant source of protein and income in LMICs (FAO, 2018) and that the demand for animal-sourced protein is growing. Population growth and changing consumption patterns linked to urbanization and increasing income are driving this growth in demand (Chaiban et al., 2020). In turn, this increase in demand drives changes in the poultry sector such as expansion (where more people are producing poultry), intensification of production (where larger numbers of poultry are produced per site) and increased trade of products. While increasing demand for poultry products drives intensification at the country level, this may not always mean equal benefit to all smallholder producers (Chaiban et al., 2020). In LMICs, the poorest and smallest producers frequently benefit less from the overall economic growth and transformation of the market structure than more resource-endowed producers (FAO, 2018).

Across Tanzania, chickens are critical sources of animal-sourced food for a variety of reasons. The first and most important is that 86 percent of the livestock-keeping households in the country own chickens (MLDF, 2015). Roughly 80 percent of the chickens are owned by women, who have control over decisions on sales and consumption of poultry meat and eggs (Tavener et al., 2019; Shapa et al., 2021). Second, most chickens are sold live and do not require central processing plants and extensive cold chains, although increasing intensification and larger numbers of poultry per site may change this to some degree in the future. Third, a chicken can be consumed in one meal by a rural household, compared with larger ruminant animals that generate too much meat to be consumed in one meal and require acceptable storage practices for the remaining product. Eggs are also acceptable units for one meal and can be stored for several days without refrigeration. Finally, a poultry enterprise is relatively easy to manage, requiring a small capital investment, compared to ruminants or row crops, while promising income generation within a short time and, therefore, attracts more women and youth (Hundie et al., 2019; Ngongolo and Chota, 2021). Attracting more women can be important to improving dietary diversity for the household.

Lack of diet diversity

Agricultural diversification with legumes, fruits, vegetables and animal-sourced food has significant potential to improve dietary diversity (De Bruyn et al., 2018). Poultry products could contribute to increased dietary diversity, and Tanzania has targeted improvement of livestock

productivity and the functioning of value chains to contribute to improving household income and nutritional security through the Agricultural Sector Development Plan phase II (ASDP II 2017-2028) and the Tanzania Livestock Master Plan (TLMP) (Michael et al., 2018). Protein from animal-sourced food contains essential amino acids and numerous micronutrients (especially iron and zinc, along with vitamins A and B₁₂) in a form readily absorbable in the human body compared with smaller quantities and lower bioavailability in plant-sourced foods (Perignon et al., 2018). However, in Tanzania, diets are dominated by starchy staple crops such as maize, rice, sorghum, millet, roots and tubers (cassava, sweet potatoes and Irish potatoes), banana and plantain (Wilson et al., 2021). As a result, levels of malnutrition are high throughout the country and largely attributed to the lack of dietary diversity. In 2015, the United Nations pledged its joint support for 17 Sustainable Development Goals (SDGs), with the second goal designed to “end hunger, achieve food security and improved nutrition and promote sustainable agriculture” by the year 2030 (U.N., 2015).

Achieving this goal, specifically in Tanzania but in general across all sub-Saharan Africa, is a daunting challenge because the rapid growth in human population indicates that the demand for major cereal crops will increase three-fold while that of animal-sourced food will double by 2050 (Thornton, 2010; Van Ittersum et al., 2016). The shocking incidence of food insecurity and undernutrition resulting from micronutrient deficiency in all sub-Saharan Africa is associated with limited dietary diversity among households (Rajendran et al., 2017), and Tanzania is an ordinary example of a country facing severe challenges where limited dietary diversity is routine among disadvantaged urban and rural poor households (Alphonse, 2017; Chegere and Stage, 2020). In most developing economies, undernourishment is strongly associated with limited animal-sourced food consumption (Adesogan et al., 2020).

Diversifying diets by including more animal-sourced foods is a vital means to improve growth, development and cognitive responses in young children, particularly during the first 1,000 days of life (Stark et al., 2020). In Tanzania, chickens are managed and owned, for the most part, by women (De Bruyn et al., 2017), who are primarily responsible for household diets (Ochieng et al., 2017). Therefore, addressing production constraints and improving the productivity of chickens could provide a direct conduit to improve access to nutritious diets in the household and thus a reduction in undernutrition (Wilson et al., 2021). Diversification in the farming systems of smallholder farmers is an important indicator of household dietary diversity, particularly for poor rural households (Timler et al., 2020), and has been considered as a coping strategy to deal with the effects of global climate change (McCord et al., 2015).

Wilson et al. (2021) found that the soybean, corn and poultry value chains were particularly interconnected at the smallholder farming system level and at the level of processing facilities. The production of corn, soybeans and chickens can directly contribute to a diverse household income through the sale of surplus produce. Smallholder farmers can participate in one or more value chains (Leonardo et al., 2018) while benefiting directly from their own production and consumption. In addition, smallholder households could access diverse diets through the food purchase pathway (De Jager et al., 2017), whereby crop smallholders could access chickens and eggs with cash generated through the sale of corn and soybeans.

Addressing constraints

Wilson et al. (2022) grouped constraints faced by smallholder poultry farmers into three major categories – financial, technical and institutional constraints. Financial constraints were related to farm size, while technical constraints were related to farmers' knowledge of chicken production and management concerns such as veterinary measures, feed access and availability, and management practices. Other technical factors included knowledge and awareness of farmers on recordkeeping, entrepreneurship and marketing skills, and gender roles in different managerial aspects at the household level (Wilson et al., 2022). Institutional constraints included public support services and physical infrastructure (i.e., roads, water supply, energy availability and communication technology), market infrastructure, finance availability and credit facilities (Mapiye et al., 2008). The major constraints identified by Wilson et al. (2022) were chicken diseases, poor availability of day-old chicks, theft and limited access to quality feed and/or feed ingredients. Other challenges included limited knowledge of managerial practices, market availability, predators, limited access to vaccines and medications, lack of capital, and limited Extension services and personnel to offer advice.

Numerous researchers working in various areas across the entire sub-Saharan Africa region for several years have documented, over and over, the same constraints to poultry production, whether at the scavenging, semi-intensive or intensive level. Diseases (especially Newcastle and coccidiosis), limited access to quality feed, limited access to day-old chicks, limited or no access to Extension programming and personnel, limited or no access to capital, limited or no infrastructure, limited knowledge of management practices (especially where intensive production using improved or exotic breeds is concerned), and limited access to market availability show up time and again in research findings. Defining and understanding the long list of constraints is no longer the issue. Addressing these constraints is now the challenge. Can they be addressed in a way that will make a difference? That is the question.

Chickens have much potential in Tanzania and across sub-Saharan Africa. Numerous studies have come to that same conclusion; however, it will take more than aid money to address the constraints and reach that potential. Make no mistake – money is important and vital to success, but money alone is not the answer. Just about everything that makes the poultry industry successful in the U.S. today is either unheard-of, nonexistent or in extremely short supply in Tanzania and most of sub-Saharan Africa. That means the boots on the ground must think differently and consider where they are, what they have access to and the daily conditions that smallholder farmers face. Don't think of the U.S. poultry production model in 2023; that template won't work. Instead, think of U.S. poultry production in 1950, maybe even 1940, because that is closer to reality in much of sub-Saharan Africa. There is little to no infrastructure, or even an infrastructure framework, that currently exists and upon which a fledgling poultry industry can be built. Much of what exists is hope or an idea or a dream of what might be, similar to what U.S. poultry pioneers faced in the 1930s and 1940s when the U.S. poultry industry began, but hope is a good thing.

Where to go from here?

Optimistic folks always see the glass as half full and, despite all the constraints, there is hope for the food security challenge facing Tanzania and the rest of sub-Saharan Africa. Chickens are a part of that hope; however, developing a sustainable poultry industry where little to none exists is

not a monthslong or even yearslong project; think more in terms of decades. Consider that it has taken the U.S. poultry industry almost 100 years to get to where it is today. Mistakes were made along the way, but the industry learned from those mistakes and adapted to reach the point it is today. There are many smallholder farmers across Tanzania and much of sub-Saharan Africa striving to make a better living for themselves and their families. Mistakes will likely be made as the poultry industry struggles to develop, but that's OK. Learning from those mistakes, taking ownership of the situation and adapting to that situation is a recipe for success. Adapting means working around the fact that there are few roads, very little infrastructure, an unreliable power/energy grid, little to no large-scale feed milling capability, limited hatchery capability to supply day-old chicks, little understanding of disease prevention/control, vaccine cold chains and biosecurity by smallholder farmers, and little or no access to Extension services and personnel for guidance and advice.

It sounds like a daunting task, and it is; however, the constraints and challenges to poultry production in the region are well-known, and that is a critical first step. Transforming existing low-input/low-output smallholder poultry production systems will require effort and demand technological advances in genetics, feed production and availability, disease control and veterinary services, housing environment and flock management, Extension outreach services and information dissemination, and public-private partnerships to deliver integrated innovation packages. The U.S. poultry industry has roughly a 100-year head start on Tanzania, but there was a time when no U.S. poultry industry existed – no feed mills, no hatcheries, no vaccines or biosecurity programs, and no Extension services. The U.S. poultry industry overcame all that and knows how to address those constraints. More can and must be done to address those constraints and the time has come to fish or cut bait. It will require talented people with poultry smarts and, more importantly, with passion (and compassion) to help those less fortunate and address the grand challenge of feeding a growing global population. Those folks exist, and this is doable. Money alone is not the answer, however, so we must think differently – think capacity-building, think skills-training opportunities, think economic development programs and think creating a business/industry out of what, in the past, has just been a way to make ends meet.

References

- Adesogan, A.T., A.H. Havelaar, S.L. McKune, M. Eilittä and E.G. Dahl. 2020. Animal source foods: Sustainability problem or malnutrition and sustainability solution? Perspective matters. *Global Food Security*. 25:100325.
- Alphonse, R. 2017. Ending rural hunger: The case for Tanzania. African Growth Initiative. Global Economy and Development Program at Brookings Institute. Washington, D.C., USA. Available at: [brookings.edu/wp-content/uploads/2017/10/erh-tanzania-case-study.pdf](https://www.brookings.edu/wp-content/uploads/2017/10/erh-tanzania-case-study.pdf). Accessed: April 18, 2023.
- Baker, D., N. Mtimet, U. Pica-Ciamarra and L. Nsiima. 2016. Consumers' preferences for animal-source foods and retail outlets: The case for Tanzania. *African Journal of Agricultural and Resource Economics* 11:197-210.
- Birhanu, M.Y., R. Osei-Amponsah, F.Y. Obese and T. Dessie. 2023. Smallholder poultry production in the context of increasing global food prices: roles in poverty reduction and food security. *Animal Frontiers* 13(1):17-25.
- Chaiban, C., T.P. Robinson, E.M. Fèvre, et al. 2020. Early intensification of backyard poultry systems in the tropics – A case study. *Animal* 14:11 pp 2387-2396.

- Chegere, M.J., and J. Stage. 2020. Agricultural production diversity, dietary diversity and nutritional status: Panel data evidence from Tanzania. *World Development* 129:104856.
- De Bruyn, J., P.C. Thomson, B. Bagnol, W. Maulaga, E. Rukamile and R.G. Alders. 2017. The chicken or the egg? Exploring bi-directional associations between Newcastle disease vaccination and village chicken flock size in rural Tanzania. *PLoS One*. 12(11).
- De Bruyn, J., B. Bagnol, I. Darnton-Hill, W. Maulaga, P.C. Thomson and R. Alders. 2018. Characterizing infant and young child feeding practices and the consumption of poultry products in rural Tanzania: A mixed methods approach. *Maternal and Child Nutrition* 14(2):e12550.
- De Jager, I., A.R. Abizari, J.C. Douma, K.E. Giller and I.D. Brouwer. 2017. Grain legume cultivation and children's dietary diversity in smallholder farming households in rural Ghana and Kenya. *Food Security* 9(5):1053-1071.
- FAO (Food and Agriculture Organization of the United Nations). 2018. *World livestock: Transforming the livestock sector through the sustainable development goals*. FAO, Rome, Italy.
- FAO, IFAD, UNICEF, WFP and WHO. 2021. *The state of food security and nutrition in the world 2021. Transforming food systems for food security, improved nutrition and affordable healthy diets for all*. FAO, Rome, Italy.
- Guni, F., S. Mbagha, A. Katule and E. Goromela. 2021. Performance evaluation of Kuroiler and Sasso chicken breeds reared under farmer management conditions in highland and lowland areas of Mvomero district, Eastern Tanzania. *Tropical Animal Health and Production* 53:1-8.
- Hundie, D., G. Goshu, B. Tamir and G. Duguma. 2019. Assessment on rural poultry production and marketing system of Horro chicken ecotypes in Western Ethiopia. *Journal of Agricultural Extension and Rural Development* 11:248-259.
- Leonardo, W., G.W. van de Ven, A. Kanellopoulos, and K.E. Giller. 2018. Can farming provide a way out of poverty for smallholder farmers in central Mozambique? *Agricultural Systems* 165:240-251.
- Mapiye, C., M. Mwale, J. Mupangwa, et al. 2008. A research review of village production constraints and opportunities in Zimbabwe. *Asian-Australasian Journal of Animal Sciences* 21:1680-1688.
- Mbuli, C.S., L.N. Fonjomg, and A.J. Fletcher. 2021. Climate change and small farmers' vulnerability to food insecurity in Cameroon. *Sustainability* 13:1523.
- McCord, P.F., M. Cox, M. Schmitt-Harsh and T. Evans. 2015. Crop diversification as a smallholder livelihood strategy within semi-arid agricultural systems near Mount Kenya. *Land Use Policy*. 42:738-750.
- Michael, S., N. Mbwambo, H. Mruttu, et al. 2018. *Tanzania Livestock Master Plan*. International Livestock Research Institute, Nairobi, Kenya. Available at: ilri.org/publications/tanzania-livestock-master-plan. Accessed: 17 April 2023.
- MLDF (Ministry of Livestock Development and Fisheries). 2015. *Tanzania Livestock Modernization Initiative*. MLDF, Dar es Salaam, Tanzania.
- Mushi, J.R., G.H. Chiwanga, E.N. Amuzu-Aweh, et al. 2020. Phenotypic variability and population structure analysis of Tanzanian free-range local chickens. *BMC Veterinary Research* 16:1-10.
- Naggujja, J., N. M. Njiru, P. Msoffe, A. Naazie, T. Kelly, D. K. Enahoro, and E. A. Ouma. 2020. *Tanzania and Ghana poultry sector policy review*, International Livestock Research Institute, Nairobi, Kenya. Available at:

- cgispace.cgiar.org/bitstream/handle/10568/110529/Tanzania%20and%20Ghana%20poultry%20sector%20policy%20review_Brief.pdf?sequence=1&isAllowed=y.
Accessed: April 17, 2023.
- Ngongolo, K., and A. Chota. 2021. Chicken production, flock size, management systems, and challenges in the Dodoma region of Tanzania. *Poult. Sci.* 100:101136. Available at: doi.org/10.1016/j.psj.2021.101136. Accessed: April 17, 2023.
- Ochieng, J., V. Afari-Sefa, P.J. Lukumay and T. Dubois. 2017. Determinants of dietary diversity and the potential role of men in improved household nutrition in Tanzania. *PLoS One.* 12(12).
- Perignon, M., T. Barre, R. Gazan, M.J. Amiot and N. Darmon. 2018. The bioavailability of iron, zinc, protein and vitamin A is highly variable in French individual diets: Impact on nutrient inadequacy assessment and relation with the animal-to-plant ratio of diets. *Food Chemistry* 238:73.81.
- Rajendran, S., V. Afari-Sefa, A. Shee, T. Bocher, M. Bekunda and P.J. Lukumay. 2017. Does crop diversity contribute to dietary diversity? Evidence from integration of vegetables into maize-based farming systems. *Agriculture and Food Security* 6(1):50. 13 pages.
- Sanka, Y., S. Mbagi, S. Mutayoba, A. Katule and S. Goromela. 2020. Evaluation of growth performance of Sasso and Kuroiler chickens fed three diets at varying levels of supplementation under semi-intensive system of production in Tanzania. *Tropical Animal Health and Production* 52:3315-3322.
- Shapa, M., L. Trojer and D. Machuve. 2021. Mobile-based decision support system for poultry farmers: a case of Tanzania. *International Journal of Advanced Computer Science and Applications* 12:584-590.
- Sindiyo, E., R. Maganga, K.M. Thomas, et al. 2018. Food safety, health management, and biosecurity characteristics of poultry farms in Arusha City, northern Tanzania, along a gradient of intensification. *East African Health Research Journal* 2:168-180.
- Stark, H., A. Omer, A. Wereme N'Diaye, A.C. Sapp, E.V. Moore and S.L. McKune. 2020. The Un Oeuf study: Design, methods and baseline data from a cluster randomized controlled trial to increase child egg consumption in Burkina Faso. *Maternal and Child Nutrition.* e13069.
- Tavenner, K., M. Van Wijk, S. Fraval, et al. 2019. Intensifying inequality? Gendered trends in commercializing and diversifying smallholder farming systems in East Africa. *Frontiers in Sustainable Food Systems* 3:10. 14 pages.
- Thornton, P.K. 2010. Livestock production: Recent trends, future prospects. *Philosophical Transactions of the Royal Society B: Biological Sciences* 365(1554):2853-2867.
- Timler, C., S. Alvarez, F. DeClerck, et al. 2020. Exploring solution spaces for nutrition-sensitive agriculture in Kenya and Vietnam. *Agricultural Systems* 180:102774.
- United Nations (U.N.). 2015. Transforming our world: The 2030 agenda for sustainable development. General Assembly 70 session.
- Van Ittersum, M.K., L.G. Van Bussel, J. Wolf, et al. 2016. Can sub-Saharan Africa feed itself? *Proceedings of the National Academy of Sciences* 113(52):14964-14969.
- Wilson, W.C., M. Slingerland, F.P. Baijukya, H. van Zantan, S. Oosting and K.E. Giller. 2021. Integrating the soybean-maize-chicken value chains to attain nutritious diets in Tanzania. *Food Security* 13:1595-1612.
- Wilson, W.C., M. Slingerland, S. Oosting, F.P. Baijuka, A. Smits and K.E. Giller. 2022. The diversity of smallholder chicken farming in the Southern Highlands of Tanzania reveals a range of underlying production constraints. *Poultry Science* 101:10. 102062.



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