Pathways to African Feminism and Development
Women's Economic Empowerment

ISSN (online): 2309-3625

Volume 7, NO 1 ~ 2022

African Women Studies Centre

Special Issue

Use of Poultry Production to Empower Small Holder Women Farmers in East Africa

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Abstract

Animal agriculture within developing countries, particularly in Africa, is important and plays a significant role in improving people's livelihoods, particularly of women. The poultry sector in these countries is largely based on traditional production systems, with women responsible for most of the day-to-day activities. In spite of that, women do not control the income that comes from the sale of their birds or eggs. The specific objectives of this study were to: 1) Improve the livelihood of women smallholder farmers (WSF) through increased poultry production and income and access to resources and decision making, and 2) Evaluate the empowerment of smallholder poultry farmers using the Women's Empowerment in Agriculture Index (WEAI). Sixty-nine smallholder farmers in two districts in Eastern Uganda were trained on best practices for poultry production. A questionnaire was administered immediately after the training (phase 1) and one year later (phase 2) to collect data on the five Domains of

Empowerment (5DE) These data were used to compute the 5DE index and a modified WEAI.

The findings showed that there was improved livelihood through increased poultry production, improved marketing, and access to resources through a cooperative, and increased income leading to acquisition of assets such as land. WSF were empowered with ownership of the birds and assets, engagement in domestic and local decision making, and leadership in the community. The 5DE score was 65.8% before and 82.4% one year after the establishment of the poultry enterprises. The modified WEAI was 74. 25%. Therefore, equipping WSF with necessary tools (such as training in poultry production) and resources can lead to empowerment, and improved livelihood as was demonstrated by WSF in this study.

Key words: Aggregate index; Agro entrepreneurship; food security, poultry production, relative inequality; women empowerment.

1.0 Introduction

1.1 The Role of Animal Agriculture in Developing Countries

Animal agriculture in developing countries, particularly in Africa, is important and can play a significant role in improving people's livelihoods, particularly of women (Ahmed et al 2021; Van et al., 2020; Dumas et al, 2016). Globally, poultry production is forecast to reach 134.5M metric tons by 2023, overtaking pork at 16.7M metric tons (Hedman et al., 2020). In East Africa poultry production is popular in many villages and communities because of its potential as a significant source of income and quality protein. Various scholars have reported the socio-economic importance and benefits of smallholder poultry production to several communities, including improved food security and gender equity (Guèye, 2000; Guèye, 2002; Alders and Pym, 2009; Mottet and Tempio, 2017; Wong et al., 2017). For instance, every household in the rural North Rift region of Kenya keeps 5-20 chicken (Okitoi, et al (2007). There is further evidence showing that when women manage assets and family income, there is improvement in nutrition and education of their children. The family also gains access to health services, all of which enable women to be in a more privileged position in the family and in their community (Ahmed, et al 2021). Based on these studies, targeting, and improving poultry production would reach and impact women and families quickly and directly. It would increase the quantity and quality of the birds by equipping the women who are the primary producers with experiential knowledge

and transferable skills. Poultry, which most households are engaged in, would be a measurable way of providing a higher sustainable source of protein, income, and subsequently, empower the women to engage in decision-making. This paper starts with an articulation of the problem statement and progresses to an analysis of relevant literature that guided the objectives and research questions.

1.2 The Problem

Despite the acknowledged current and potential benefits of poultry as an accessible sustainable source of income for women and for gender parity, ownership of resources (including poultry) is male dominated. Women and children are responsible for the day-to-day poultry keeping chores of feeding and cleaning sheds, but they do not control the income from the sale of the birds or eggs (Galiè et al, 2015; Otieno Onyalo, 2019). Moreover, in addition to the time-consuming poultry keeping activities, there are numerous constraints associated with local smallholder farmer poultry systems that render the income inadequate and unsustainable. They include shortage of extension staff, low productivity of village chickens, a lack of knowledge on best management practices, lack of access to financial services and a proper marketing strategy (Njuki et al., 2011; Wong et al., 2017) and inadequate poultry nutrition programs. Thus, rural communities, especially women whose livelihoods are dependent on poultry production, remain trapped in abject poverty.

1.3 Goal and Objectives of the Study

The goal of the study was to contribute to gender parity through improving the quality and quantity of poultry production and marketability. It is anticipated that increased poultry production will lead to economic empowerment through higher sustainable income that will lead to significant improvement in all the five domains of Women Empowerment (5DE), namely, agricultural production, resources, income, leadership, and time (Table 1). Indicators tracked under each domain include:

1) Production: Sole or joint decision making over food and cash-crop farming, livestock, and fisheries as well as autonomy in agricultural production;
2) Resources: Ownership, access to, and decision- making power over productive resources such as land, livestock, agricultural equipment, consumer durables, and credit;
3) Income: Sole or joint control over income and expenditures;

4) Leadership: Membership in economic or social groups and comfort in speaking in public;

5) Time: Allocation of time to productive and domestic tasks and satisfaction with the available time for leisure activities.

The overall aim of this study was to assess if equipping small holder poultry farmers (particularly women) with knowledge and skills in best practices in poultry production could serve as a practical intervention tool that translates into increased poultry production and improvement in all five domains of women economic empowerment (5DE) (Figure 1).

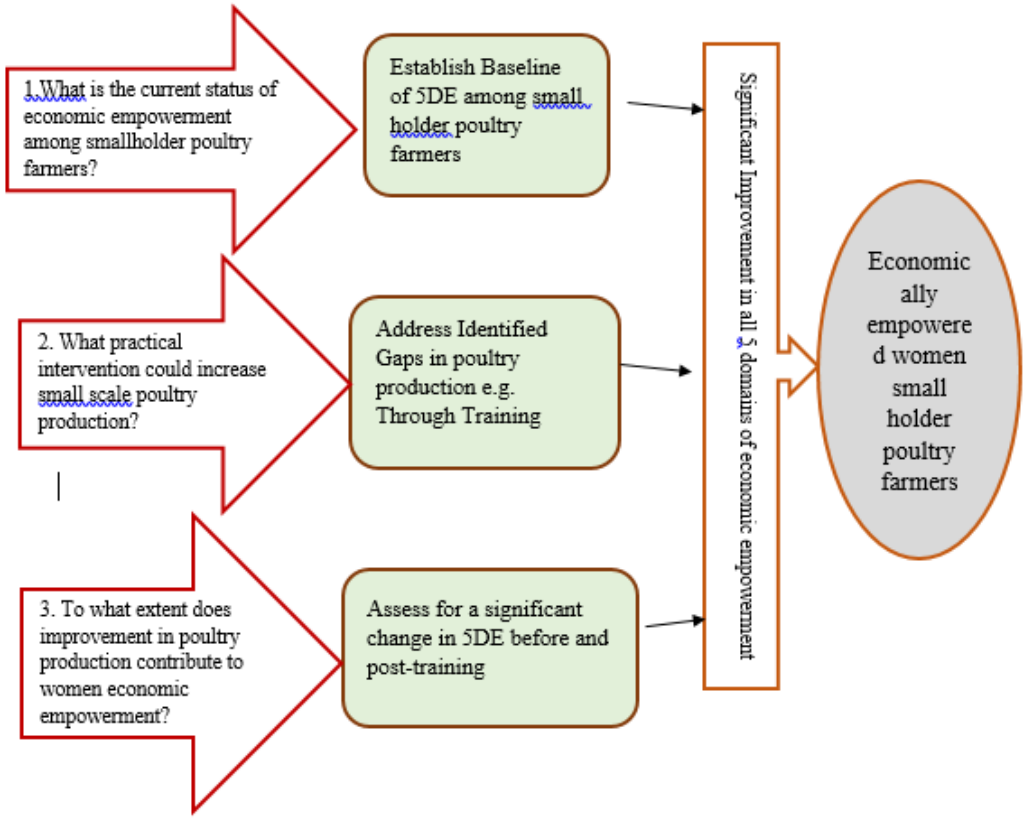


Figure 1: Theory of change for economic empowerment of smallholder poultry farmers

The specific objectives of the study were to:

1) Establish a baseline of the five domains of Women Empowerment (5DE) in agriculture among 69 smallholder households engaged in poultry production in Eastern Uganda;

2) Provide training on gaps identified in the 5DE, particularly on knowledge and skills in best practices for poultry production; and

3) Assess the impact of the training on poultry production and economic empowerment through significant improvement in all five domains of Women Empowerment (5DE).

There were three research questions:

1) What is the current status of economic empowerment among smallholder poultry farmers (particularly women) in Uganda?
2) Does direct intervention to smallholder farmers' practices such as training increase small scale poultry production?
3) To what extent does improvement in poultry production contribute to women economic empowerment?

1.4 The Theory of Change (ToC)

Our theory of change (Figure 1) is rooted in the socio-economic research (Ahmed et al, 2021) conducted on small holder farmers in LICs and MICs that indicates that family poultry ownership for women is a source of cash for basic family needs, can open access to credit for women, and is increasing women's decision-making and economic power within the household and in the community (Ahmed et al, 2021). This research informed our hypothesis that training WSF (particularly women) in Uganda and providing them with the resources and knowledge on best practices for poultry production would economically empower them in all the five domains of empowerment: 1) improving productivity and marketing of their birds and eggs, 2) increasing their household income and assets, and 3) improving their participation in control of expenditure of household income, and ownership of assets, 4) participation in social groups and comfort in taking on leadership positions, and 5) satisfaction with allocation and use of available time.

2.0 Literature Review

2.1 Global Food Consumption Trends Shifting Towards Livestock Products

Globally, as the standard of living improves and the middle-income class grows, there has been a notable shift in food consumption patterns away from crop-based diets towards animal source foods. This change has especially aligned with a global increase in consumption of poultry meat (Hedman et al., 2020). For developing countries, particularly those in sub-Saharan Africa (SSA), one contributing factor to the growth in chicken consumption is that indigenous

chicken is prevalent in most rural households (Ngeywo et al, 2021) and these chickens provide cheap animal protein in the form of meat and eggs. Also, the African continent has one of the fastest growing populations globally and chickens adapt well to climate change as compared to other livestock (Thornton et al., 2009; Mengesha, 2011; Thornton and Herrero, 2015).

2.2 The Importance of Poultry in Developing Countries

According to Baltenweck et al (2020) in African contexts, in addition to providing cheap animal protein, livestock play other functions such as serving as an asset, acting as a store of wealth for resilience and playing a role as a contributing factor to mixed farming. A study by (Gueye, 2009) reported that in Africa, the poultry sector is dominated by indigenous chicken. Also, chicken production is a comparatively more efficient production system than other livestock sectors (Mengesha, 2011). The indigenous poultry in Africa are, therefore, critical in addressing food security challenges, particularly in the face of climate change and the fast human population growth (Pius et al, 2021). Furthermore, data from various studies show that livestock contribute to women empowerment and gender equality in communities of many low- and middle-income countries (Alders and Pym, 2009; Ahmed et al., 2021). Culturally, many women in these countries do not own many assets and livestock are one of the few assets that women can own and use in their empowerment. Also, livestock improve women's income, access to information through leveraging social networks and help provide nutritious food to their families (Alders et al 2018).

2.3 The Need for Increased Extension Presence and Training on Best Agricultural Practices

According to Liverpool-Tasie et al (2019), there is a need for training poultry farmers in particular smallholder producers. Available statistics show that only 4%, 30% and 30% of small, medium, and large poultry producers have received some training in poultry production best practices (Liverpool-Tasie et al, 2019). Smallholders are, therefore, not in a position to utilize available technologies, thereby leading to low productivity. Efficient use of technology would substantially increase production. Also, in general, there is a shortage of extension personnel, particularly women. This issue greatly disadvantages women farmers who are more comfortable with women extension staff.

2.4 Gender Issues in Poultry Production in Rural Households

In general, more women and children care for chickens compared to men (Dessie et al. 2003; Mapiye and Sibanda 2008). Men may assist to perform duties such as construction of poultry houses and marketing of birds and eggs. However, women perform most of the day-to-day duties such as feeding, watering, and applying treatments to the birds (Dessie et al. 2003; Mapiye and Sibanda 2008). However, women do not control the income that comes from the sale of the birds or eggs (Galiè et al, 2015; Otieno Onyalo, 2019). However, other socio-economic research studies on small holder farming in low-income countries (LICs) and middle-income countries (MICs) around small holder farming indicate that women are the primary owners of family poultry (Ahmed et al-2021). A recent study from Bangladesh shows that family poultry ownership is increasing women's decision-making and economic power within the household and in the community (Ahmed et al-2021). The study shows that poultry production is also a source of cash for basic family needs and can open access to credit for the women (Ahmed et al-2021).

This study will draw on evidence from such studies to assess if equipping small holder poultry farmers (particularly women) in a LIC such as Uganda with knowledge and skills in best practices in poultry production could translate into increased poultry production and improvement in the five domains of women economic empowerment (5DE).

3.0 Methodology

3.1 Study Area

The study area comprised two districts: District A and District B, both located in Eastern Uganda. Uganda is a landlocked country with an area of 241,038 km². Kampala is its largest city as well as the capital with a population of 1.2 million. The country is divided into four regions: Northern, Central, Eastern, and Western which are subdivided into 111 districts (Uganda Bureau of Statistics, 2014). In 2014 the population of Uganda was estimated to be 34, 634, 650 of which 27% in Central, 26% in Western, 25% in Eastern, and 22% in Northern region. The study districts population was 174, 508 and 244,158 for district A and B, respectively (Uganda Bureau of Statistics, 2014). Lumutenga et al. (2017) offer a more detailed description of the study area and women groups.

3.2 Training

A team of trainers from the Africa Institute for Strategic Animal Resource Services and Development (AFRISA), College of Veterinary Medicine, Animal Resources and Biosecurity, Makerere University, Uganda provided 6 months three-phased training to 69 families located in the two districts. The women had been identified by Higher Education Resource Services, East Africa (HERS-EA) a non-governmental organization advancing women empowerment in East Africa (Khaitsa et al, 2017). The training was in best practices for poultry production (local and exotic breeds) including, but not limited to housing, nutrition, biosecurity, disease management, and agro entrepreneurship. During the six months of training the farmers raised the birds on their own with close supervision. However, they were provided with continued training and mentorship for an additional six- months post training. One year after the training, summative and formative evaluations were conducted to assess the knowledge and competence of the farmers in the areas trained. The evaluation was expanded to assess improvement in indicators of the five domains of women economic empowerment (5DE).

3.3 Empowerment Assessment Methods

Two sub-indexes were used in this study: 1) Women's Empowerment in Agriculture Index (WEAI) and 2) Gender Parity Index (GPI), both of which are described in detail elsewhere (IFPRI, 2012). Briefly, the WEAI assesses whether women are empowered across the five domains listed in Table 1. In addition to tracking empowerment in the 5DE, the WEAI determines the gender empowerment gap. The ten indicators of the WEAI in the 5DE are used to build individual empowerment profiles (USAID, 2012). An empowered individual is one who achieves *'adequacy'* in 80% or more of the weighted indicators (USAID, 2012). This Index also shows areas of disempowerment which can then be improved. The decision makers can, therefore, give priority to improving areas of need among disempowered women.

3.4 Calculating the WEAI

Calculating the WEAI involves calculating 5DE and GPI. Thus:

$$\mathbf{5DE = H_e + H_n (A_a)}$$

H_e = % of women who are empowered

H_n = % of women who are not empowered (1- H_e)

A_a = % of dimensions in which disempowered women have adequate

achievements

The Gender Parity Index (GPI) = 1-H_w (R_p)

H_p = % women with gender parity

H_w = % women *without* gender parity

R_p = average empowerment gap between women compared with men in their household.

WEAI = 0.9(5DE) + 0.1(GPI) or

WEAI = 0.9{He+ (H_n x A_a)} + 0.1{1 - (H_w x R_p)}

3.5 Data Collection Methods

A questionnaire was administered to 69 respondents twice. The first time was at the beginning of the training, in June 2018 and was administered by AFRISA as a Baseline Survey on best practices in poultry production (Phase one). The second one was done one year after the training, in July 2019 (Phase two). The questions were grouped into six categories according to biographic data and the 5DE as follows: production, resources, income, leadership, and time. The variables ranged from age, gender, marital status, level of education, family size and composition *(Biography);* ownership of animals, types and number of animals owned *(agricultural production);* ownership of land, ownership of other assets such as trees, perennial crops, phones and bicycles *(resources);* income earned, who decides on how to spend money at home, *(income);* ability to talk in public, membership in social groups or community groups, and leadership position held in the community *(leadership);* the work load and how they spend their time - work and leisure time balance *(time).*

3.6 Data Analysis

Data were transferred from the questionnaires to an excel spreadsheet. A unit of identification was the individual respondent. Descriptive statistics of respondents were computed using "R" Software. A Chi-square test of proportions was used to evaluate if there was a significant change in the proportion of respondents with a certain indicator within the 5DE in phase one and two. This comparison was to assess the impact of the training in poultry production on the indicators within the 5DE. Also, the 5DE sub-index (agricultural production, resources, income, leadership, and time) was computed. The 5DE Index and its subindexes were estimated as described in the original WEAI (Alkire et al. 2013) and pro-WEAI (Malapit et al, 2019).

3.7 Computing the 5DE Index

A detailed methodology and algebraic equations for computing 5DE Index and its subindexes is described elsewhere (Alkire et al. 2013; Malapit et al. 2019). This study used a custom R-code that wraps models for computing the 5DE Index and its components. Ten measurable indicators carefully gathered from the questionnaire were equally weighted (1/10) and assigned to the primary domains (Table 1). These indicators and weights were proposed having considered the nature of the data collected and the local context (social and cultural) of the study area. The indicators and weights were modified slightly from those provided in the original WEAI. Estimation of 5DE Index was based on a cut-off characterized as adequate or inadequate achievement, with respect to the responses to the survey questions (Table 1). An individual was considered empowered if she or he had 80% adequate achievement and disempowered respondents experienced adequate achievements in some indicators. Table 1 shows a summary of indicators and weights used to assess women empowerment in this study. It is worth mentioning that the 5DE Index does not provide details of the indicators that may need attention. We, therefore, disaggregated the Index (Decomposition of 5DE) by computing the individual contribution of each of the ten indicators.

Table 1: Domains, indicators, weights, & achievement thresholds used in the study

Domains	Indicator	Weight
Production	Poultry Production	1/10
	Livestock Production	
Resources	Land Ownership	1/10
	Assets on Land	1/10
Income	Earn Income	1/10
	Sell or Buy Items	1/10
Leadership	In Social Group	1/10
	Leadership Position	1/10
Time	Working Time	1/10
	Leisure Time	1/10

Source: The weights and cut-off were constructed by the authors, table modified from IFPRI (2012).

4.0 Results

4.1 Demographic Characteristics of Respondents

The majority (73%) of the respondents owned < 1 acre of land which is consistent with the definition of smallholder farmers by the Food and Agriculture Organization (FAO, 2010) had limited educational opportunities and depended on agriculture for their livelihoods. Of the 69 respondents, 36% (n=25) were from District A while 64% (n=44) from district B. Most participants (62%, n=43) were women while 38% (n=26) were men. Most of them (70%, n=49/69) had spouses while 23% (n=16/69) did not have and were single or widowed); 4 (5.7%) did not respond.

During Phase one, the distribution of livestock kept by the 69 study participants was as follows: poultry (46.4%, n=32). The number of birds kept ranged from 1 to 100 with a median of 7 birds. A total of (43.5%, n=30) owned goats; the numbers ranged from 1 to 25, with a median of 4 goats. There were (57.1 %, n=39) respondents who owned cattle, the range was 1 to 17 with a median of 7 cows. Only 4 out of 69 respondents (5.7%) owned pigs, with a range of 1 to 4 pigs, and a median of 2 pigs. In phase two, the number of respondents dropped from 69 to 53, and Table 3 summarizes the descriptive statistics of the variables in the five domains of empowerment. Most poultry houses were constructed out of mud with iron roofs with wood shavings serving as poultry litter. The main component of feed was corn (commonly known as maize bran) supplemented with silver fish or *Haplochromis spp.* (*mukene*) as the main protein source. The brooding equipment that supplied heat to poultry chicks comprised clay pots with charcoal and watering utensils comprised plastic containers. Figure 2 summarizes the distribution of the respondents' age and level of education. The respondents were between 18 and 81 years of age with a median age of 44. The majority (56%, n=38) had completed primary and secondary education and only four (5.8%) had never attended school. The level of education ranged from none (4/69, 5.8%) to primary level (16, 24%), Ordinary level (22, 32%), advanced level (8, 12%), and university level (4/69, 5.8%)

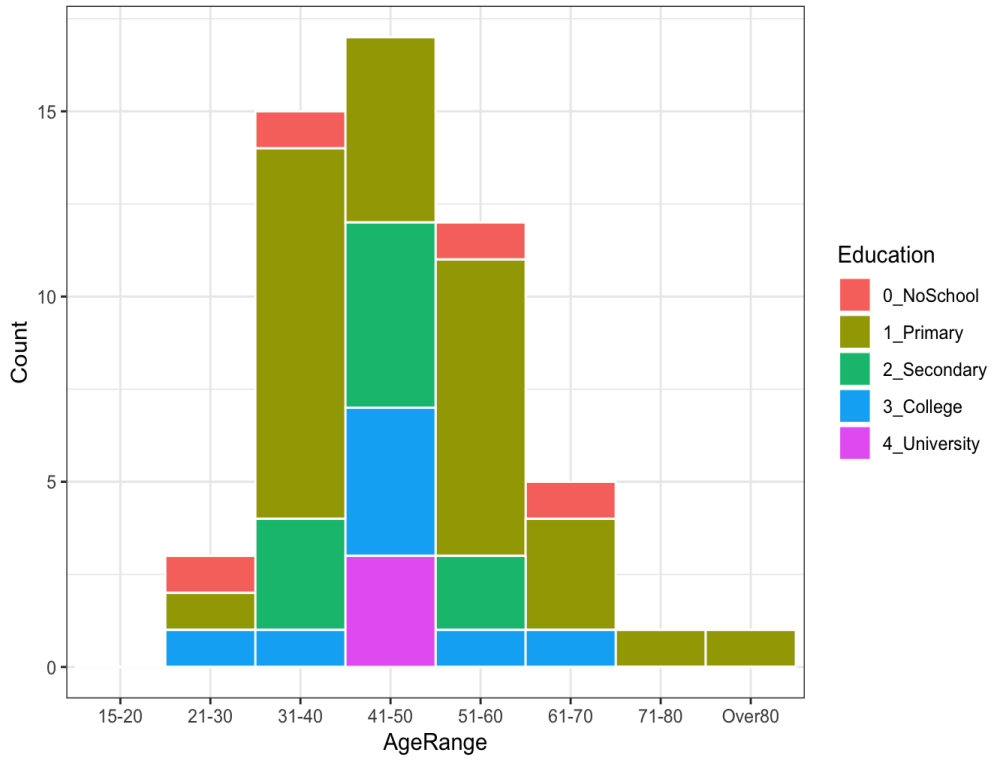


Figure 2: *Distribution of respondents' age and level of education (N=69, Response =54)*

Table 2: Descriptive Statistics of Select variables of the study population in the five

Domain/Variable	Frequency% (n) Phase 1	Frequency % (n) Phase 2	Test of proportions (Chi-square P-value)
Production			
Chicken			P=0.026
Yes	46.4(32)	92.45(49)	
No response	52.86(37)	7.55(4)	
Cattle			P=0.337
Yes	57.1(39)	60.38(32)	
No response	42.86(30)	39.62(21)	
Goats			P=0.746
Yes	43.5(30)	64.15(34)	
No response	55.71(39)	35.85(19)	
Pigs			P=0.082
Yes	5.7(4)	18.87(10)	

No response	94.2(65)	81.13(43)	
Resources			
Own Land			P≤0.001
Yes	54.43(43)	59.49(47)	
No	32.91(26)	7.59(6)	
No response	12.66(10)	32.91(26)	
Land size			P=0.037
≤1 acre	39.24(31)	18.99(15)	
2-5 acres	34.18(27)	36.71(29)	
5-10 acres	20.25(16)	36.71(29)	
>10 acres	3.8(3)	6.33(5)	
No response	2.53(2)	1.27(1)	
Assets on land			P=0.026
Perennial Crops	51.9(41)	29.11(23)	
Trees	21.52(17)	25.32(20)	
Animals	20.25(16)	34.18(27)	
No response	6.33(5)	11.39(9)	

Table 2 (cont'd): Descriptive Statistics of Select variables of the study population in the five domains of empowerment (5DE) during Phase 1 (N=69) and Phase 2 (N=69)

Domain/Variable	Frequency % (n) Phase 1	Frequency % (n) Phase 2	Test of proportions (Chi-square P-value)
Income			
Earn Income			P=0.028
Yes	73.42(58)	53.16(42)	
No	20.25(16)	37.97(30)	
No response	6.33(5)	8.86(7)	
Source of Income			P=0.001
Homework	58.23(46)	29.11(23)	
Sell produce	16.46(13)	11.39(9)	
Home-based Business	16.46(13)	32.91(26)	
Salary	6.33(5)	16.46(13)	
No response	2.53(2)	10.13(8)	
Who buys items at home			P=0.103
Me	36.71(29)	26.58(21)	

Both on Consultation	26.58(21)	17.72(14)	
My spouse	20.25(16)	39.24(31)	
Other (sponsor, children, etc.)	12.66(10)	13.92(11)	
No response	3.8(3)	2.53(2)	
Allowed to sell or buy			P=0.002
Me	62.03(49)	36.71(29)	
Both on Consultation	24.05(19)	27.85(22)	
No response	13.92(11)	35.44(28)	
Who decides how to spend			P=0.001
Me	56.96(45)	34.18(27)	
Other	16.46(13)	8.86(7)	
My spouse	12.66(10)	13.92(11)	
No response	12.66(10)	35.44(28)	
Both on Consultation	1.27(1)	7.59(6)	

Table 2 (cont'd): Descriptive Statistics of Select variables of the study population in the five domains of empowerment (5DE) during Phase 1 (N=69) and Phase 2 (N=69)

Domain/Variable	Frequency % (n) Phase 1	Frequency % (n) Phase 2	Test of proportions (Chi-square P-value)
Leadership			
Allowed to speak in public			P=0.016
Yes	81.01(64)	64.56(51)	
No response	13.92(11)	32.91(26)	
No	5.06(4)	2.53(2)	
Ever spoken in public			P=0.002
Yes	63.29(50)	62.03(49)	
No	18.99(15)	3.80(3)	
No response	17.72(14)	34.18(27)	
Held Leadership position			P=0.002
Yes	49.37(39)	50.63(40)	
No	36.71(29)	16.46(13)	
No response	13.92(11)	32.91(26)	
Belong to social groups			P≤0.001

Yes	64.56(51)	65.82(52)	
No	21.52(17)	1.27(1)	
No response	13.92(11)	32.91(26)	
Time			
Type of work or job			P=0.001
Homework	58.23(46)	29.11(23)	
Sell produce	16.46(13)	11.39(9)	
Home-based Business	16.46(13)	32.91(26)	
Salary	6.33(5)	16.46(13)	
No response	2.53(2)	10.13(8)	
Working time			P=0.102
Morning to midday	53.16(42)	41.77(33)	
Morning to evening	26.58(21)	20.25(16)	
No response	18.99(15)	36.71(29)	
Other	1.27(1)	1.27(1)	
Belong to social groups			P≤0.001
Yes	64.56(51)	65.82(52)	
No	21.52(17)	1.27(1)	
No response	13.92(11)	32.91(26)	
Leisure time			P≤0.001
≥ 3 hours/day	27.85(22)	16.46(13)	
≤ 1 hour/day	26.58(21)	8.86(7)	
2 hours/day	22.78(18)	10.13(8)	
No response	22.78(18)	64.56(51)	

4.2 Results of a Chi-square Test of Proportions

The results of the Chi-square test of proportions which assessed whether there was a statistically significant change among the indicators within the five domains of empowerment between Phase 1 and Phase 2 are summarized in Table 2. Overall, most indicators showed a significant change (P<0.05) between Phase 1 and 2. Among the indicators under agricultural production, there was a significant increase in poultry production between Phase 1 and 2 (P=0.026) but

not with cattle, goats, or pigs. In phase one, 46.4%, (32/69) kept poultry (range 1:100, median 7) while in phase two, 75.5% (40/53) kept poultry (range 1:70, median 10). Within the domain of who controls resources, and time, there was a significant change for most indicators except for "*Who buys items at home*" (P=0.103) and "*Working time"* (P=0.102), respectively. It is notable that the following indicators were improved significantly after training: ownership of chicken, ownership of assets such as land; income earned, ability to talk in public, membership in social groups or community groups, and leadership position held in the community (leadership) (Table 2).

Table 3 summarizes results of the disempowerment indexes of the indicators used in the study. These disempowerment indexes are uncensored and the distribution by gender (between men and women) and by phase (one and two) are shown. Data from the five domains were used to compute the 5DE index, using the formulae provided earlier. The WSF were empowered as indicated by the 5DE score of 65.8% in phase one and 82.4% in phase two after the establishment of poultry enterprises (a 15.2% increase). The male respondents showed a much smaller increase in empowerment with 5DE score of 82.4% in Phase 1 to 83.5% in Phase 2 (only 1.1% increase).

We computed a *Modified Gender Parity Index (GPI) and WEAI* of 0.009 and 0.7425, respectively, based on the formula below:

4.3 The Gender Parity Index (GPI) = 1-H_w (R_p)

H_p = % women with gender parity (82.4% in phase 2)

H_w = % women *without* gender parity (100% - 82.4% = 18.6%)

R_p = average empowerment gap between women compared with men in their household.

(83.5% (men)-82.4% (women) in phase 2 = 1.1%

WEAI = 0.9(5DE) + 0.1(GPI) or 0.9(0.824) + 0.1(GPI)

GPI = 1- 0.186 (0.011) = 0.009; WEAI = 0.9(0.824) + 0.1(0.009)

GPI was 0.009 and WEAI = 0.7416 + 0.0009 = 0.7425

The GPI sub-index reflects the percentage of women who are as empowered as the men *living in the same households*. Our study group did not have enough dual-adult households. We, therefore, calculated a modified GPI and WEAI using

aggregate data for the men and women in the study population, including those who were not living in the same households.

Table 3: The Women's Empowerment in Agriculture Index

Indicator	Female Phase 1	Male Phase 1	Female Phase 2	Male Phase 2
Uncensored inadequacy headcount ratio				
Poultry Production	0.069	0.065	0.024	0.030
Livestock Production	0.044	0.038	0.033	0.025
Land Ownership	0.031	0.008	0.003	0.000
Assets on Land	0.011	0.000	0.000	0.000
Earn Income	0.022	0.000	0.012	0.015
Allowed to Sell or Buy Items	0.040	0.004	0.042	0.020
Belong to Social Group	0.038	0.015	0.012	0.005
Held Leadership Position	0.020	0.015	0.000	0.000
Working Time	0.016	0.000	0.006	0.005
Leisure Time	0.051	0.031	0.058	0.065
Disempowerment Score (M0)	**0.342**	**0.176**	**0.190**	**0.165**
Empowerment score (5DE)	**0.658**	**0.824**	**0.810**	**0.835**

Table 4 shows the absolute and relative contribution of different indicators within the five domains of empowerment to the 5DE Index for women and men during phases 1 and 2. Results of uncensored indicators are shown, and for women in Phase 1, the contribution by different indicators ranged from 0.011 (for assets on land) to 0.069 (poultry production). In Phase 2, the contribution by different indicators for women ranged from 0.000 (for assets on land; and holding leadership position) to 0.058 (leisure time).

Table 4: Uncensored disempowerment indexes of the indicators

Feature ID	Indicator Name	UncensoredP1F	UncensoredP1M	UncensoredP2F	UncensoredP2M
D01	Poultry Production	0.069	0.065	0.024	0.030
D02	Livestock Production	0.044	0.038	0.033	0.025
D03	Land Ownership	0.031	0.008	0.003	0.000
D04	Assets on Land	0.011	0.000	0.000	0.000
D05	Earn Income	0.022	0.000	0.012	0.015

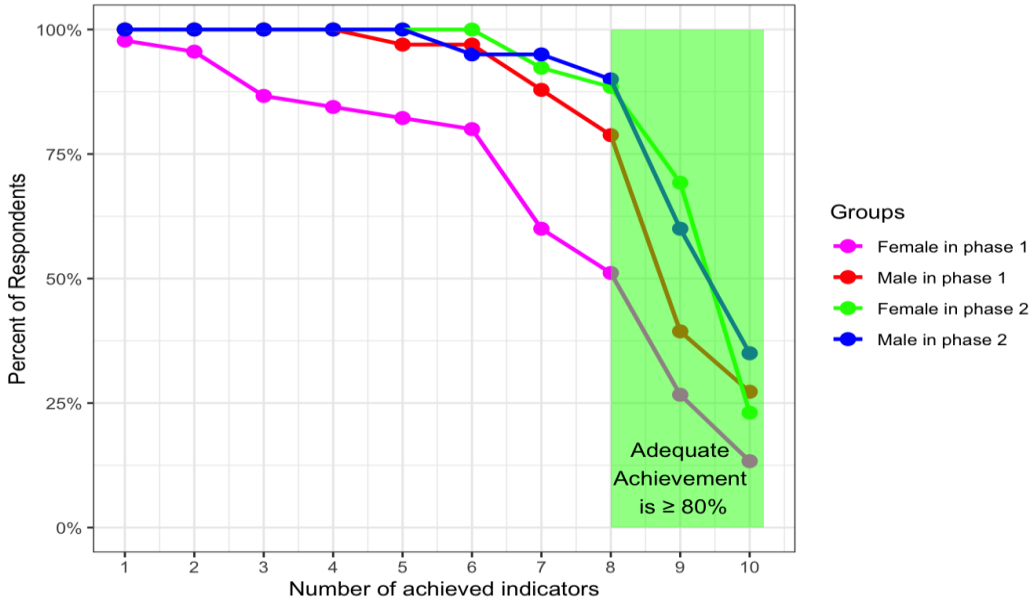
Table 4: Uncensored disempowerment indexes of the indicators

Feature ID	Indicator Name	Uncensored P1F	Uncensored P1M	Uncensored P2F	Uncensored P2M
D06	Allowed to Sell or Buy Items	0.040	0.004	0.042	0.020
D07	Belong to Social Group	0.038	0.015	0.012	0.005
D08	Held Leadership Position	0.020	0.015	0.000	0.000
D09	Working Time	0.016	0.000	0.006	0.005
D10	Leisure Time	0.051	0.031	0.058	0.065
M0	M0	0.342	0.176	0.190	0.165
5DE	**5DE**	**0.658**	**0.824**	**0.810**	**0.835**

P1=Phase 1; P2=Phase 2; F =Female; M = Male

Figure 3 summarizes results of the percent of respondents who were empowered (achieved 80% adequacy) of indicators distributed by gender (male and female) and by phase (one and two). In phase one, there was a larger difference (> 25%) between percent of respondents who reached empowerment (at 80% adequacy) among females compared to males. However, in Phase 2, the women had closed the gap and the percent of respondents that reached empowerment (at 80% adequacy) among females and males differed only by 2.5%. The area shaded green comprises percent of respondents that achieved 80% adequacy (were empowered). An individual was deemed empowered if they had adequate achievement of 80%.

Figure 3: Percent of respondents that were empowered (achieved 80% of indicators)



5.0 Discussion

This study highlighted indicators that were most associated with disempowerment within the five domains of empowerment (5DE). For instance, for women these were whether women were allowed to sell or buy items and how they utilized their time. Also, the modified WEAI obtained (0.7425) showed the gap in empowerment between the women relative to men in the study. Yet increasing women's control over agricultural production and resources has been reported to facilitate better access to animal source foods (ASF) for women and children (Okitoi et al, 2007). In rural Uganda, a study by Azzazi et al (2015) reported that owning small livestock showed potential for improving human nutrition. However, according to FAO (2016), this is still difficult for women to achieve due to the limited access women have to educational training opportunities in general, even though poultry farming has an important role for women smallholder farmers.

In sub-Saharan Africa (SSA), social entrepreneurship projects, particularly in agriculture, could facilitate women emancipation (Otieno Onyalo, 2019). Poultry is an appropriate commodity for poverty alleviation for women smallholders as evidenced by growth rates in the sector outpacing growth in other livestock commodity sectors (Hedman et al, 2020). Furthermore, because of low

capital cost required for start-up, poultry production is a readily accessible enterprise for many marginalized groups. As such, deliberate and focused interventions are required in the sector for income generation and food security in developing countries. Furthermore, since most rural households in developing countries keep poultry, and women predominate in poultry production, interventions in this sector promise to produce far-reaching, socially beneficial outcomes in the community. While women are the cornerstone for agricultural production, women face challenges related to their accessing production factors in the wider context of gender-based constraints and institutional barriers. Capacity development activities for market-driven poultry production will catalyse upstream value chain activities for sustainable agricultural production for women.

Constructing an index capable of measuring unbiased empowerment in agriculture is a strategy that furnishes policymakers with means to prioritize and make well-informed decisions. For nearly a decade, the WEAI has been used as a quantitative model for measuring women's achievement in agricultural indicators in the five dimensions of empowerment (5DE) described in the original WEAI. However, when measuring gender indicators, there are challenges that one needs to consider, including taking into consideration the local context. That way, the policies being developed or assessed will be meaningful and benefit the local people that are targeted. This is because gender inequalities play out in different ways depending on the social, cultural, or political context.

6.0 Conclusion

This study reported an improvement in the level of empowerment of women small holder farmers in Eastern Uganda after training in best practices in poultry production. Participants reported improved engagement in decision making at household level and participation in community groups, including taking on leadership roles. However, the study computed community 5DE and WEAI that showed the gender empowerment gap between the women and men participants in aggregate but not within the same household. Many of the respondents were widowed or not married and without male adults in their households, leaving many households as single gender, and making it impossible to calculate indexes by household. This made it difficult to compare empowerment of women in this study with those of men as was done in other areas where WEAI have been previously computed. This issue underscores the importance of considering the local context when proposing indicators to use in measuring women

empowerment. There is need to consult with local people in order to develop meaningful indicators that would apply to their particular situation. That is when the policies developed or assessed will be meaningful and benefit the local people targeted.

5.0 Recommendations and Further Work

- It may be beneficial to adapt the WEAI and develop an easier strategy to compute and more specifically the Women's Empowerment in Poultry Index (WEPI) that is more specific in computing empowerment among women small holder farmers. Also, replicating the WEPI among small-scale poultry farmers in other countries in SSA would shed light on the status of gender empowerment across different countries and communities. For instance, Ragsdale et al, (2022) developed a Women's Empowerment in Fisheries Index (WEFI), among men and women fisheries value chain actors in Zambia. The WEFI was adapted from the original WEAI.
- Evaluation tools developed globally need to be flexible enough to consider the cultural context in which the index will be applied when using the tool to analyse and interpret the data. This applies to indicators to use in measuring women empowerment.
- Best practices for indigenous chicken production, including breeding and genetic improvement need to be included in the pursuit of food security in Africa.
- Much of the work done by women, especially rural women who function in non-cash informal micro-economies, is unaccounted for in the computation of a country's gross domestic product (GDP), especially in LICs. There is need to review the rigid methods of computing GDP, to be more inclusive of unpaid work done by women.

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