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Research Article

Development Models in Sub-saharan Africa: Evaluation of Parish Development Model Financial Inclusion in Uganda-A Case of Women Smallholder Piggery Enterprises

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Abstract—In 2021, poverty in Uganda increased by 1.6% from 18.7% to 20.3%. An estimated 2.2 million households representing 62% in the subsistence economy of both urban and rural poor are excluded from the monetary economy. The Government of Uganda initiated a scheme to move the estimated 39% of the total households in the country from subsistence to monetary economy through the Parish Development Model(PDM). This study sought to understand how smallholder piggery enterprise has helped to improve the livelihoods of the subsistence economy households, considering the income generating potential of piggery enterprises. Therefore, the purpose of the study was to evaluate the impact of the piggery enterprises on smallholder women PDM beneficiary households two years since benefitting from the Parish Development Model(PDM) Financial Inclusion Pillar. There is little published research regarding the impact of PDM facilitated piggery enterprises on the beneficiaries. The result will assist in prioritization, provision of feedback to research and guide policy makers and stakeholders involved in the process of technology transfer. The overall objective of the study was to assess the impact of smallholder women piggery enterprise on household socio-economic development.

In the exploration of the determinants of tangible assets acquired with returns from the smallholder piggery enterprise, a non-parametric test was used to assess the contributions of number of pigs owned, number of years in piggery enterprise and earnings over the past two years from piggery. The overall fit of the model was statistically significant suggesting that the model explains a significant portion of the variance in tangible asset acquisition. Similarly, the exploration of the determinants of most significant household need supported by piggery enterprise, the contributions of number of pigs owned, number of years in piggery enterprise and earnings over the past two years from piggery was assessed and the model explained a significant portion of the variance in facilitating support for household socio-economic needs from the piggery enterprise. It can be concluded that pig husbandry plays a significant role in initiatives to reduce household poverty through enhancing quality of life and job creation. However, there is need for external facilitation and conducive policy and market environment.

Keywords— Piggery Enterprise, Parish Development Model, Women Smallholder Piggery, Dokolo District, Development Models, Government of Uganda.

1. Introduction

1.1. Sub-Saharan Africa Development Models-Overview

Uganda has received billions of dollars since independence in aid, yet the citizens appear to be worse off with the poor becoming poorer. The World Bank estimates that Uganda received approximately USD 190 billion between 1960 and 2021.In 2021, poverty in Uganda increased by 1.6% from 18.7% to 20.3%. An estimated 2.2 million households representing 62% of the subsistence economy in the country are stuck in subsistence agricultural activities [1]. Nearly 16 million people in Uganda residing in 39% of the households are categorizes as surviving under the subsistence economy.

This significant population of the country have comparatively very low-income earnings, marginal lands and some rent the pieces they survive on through subsistence food growing for domestic purposes and at times survive on hand-outs. It is no surprise that they live on international poverty line of USD 1.9 per day.

In 2007, The International Finance Corporation(IFC) reiterated that half of its projects in Africa have failed dismally including Lake Turkana Fish Processing Plant in Kenya worth USD 22 Million. The failure was attributed to the lack of taking traditional occupation as paramount.

The Turkana have neither been fishermen nor fish eating people but are age-long nomads. On the contrary the project

sought to avail jobs for the Turkana people through fishing and fish processing. Such failures are one of the many inappropriate development models that have failed dismally.
The above model including a host of others aimed for structural changes to move people and resources from peasantry into commercial agriculture and manufacturing services have similarly failed to materialize sparking rural urban migration [2].

However, there are new models of socio-economic development that focuses on the resilience of the local community and other actors in its attempt to address the challenges bedeviling the local community and actors in the face of external factors including climate change, urbanization, infrastructure development, epidemics/ pandemics and lawlessness. There are no known universally accepted meaning of development, but to many people it refers to alteration of a situation or condition for the better in some finite or infinite duration. The model has been accorded several meanings, but for this study, it is defined as; a representation of one or more concepts that may be realized in the physical world [3].

Therefore, a development model is considered a theoretical framework that serves as a strategy used to determine the economic, social, and political progress of a country or region which encompasses development sectors including industrialization, urbanization, and agricultural practices amongst others. In view of the above states and nations always initiate tailored poverty reduction initiatives with enormous consideration of the above key factors. A case in point is Uganda which has endured similar trajectories of botched development models including *Bona bagagawale* (Prosperity for All), *Entadikwa*(Start-up), *NAADS* (National Agriculture Advisory Services), *Emyooga* (specialized skills enterprises/groups), *OWC* (operation wealth creation) and recently, the famed Parish Development Model.

1.2. Uganda's Parish Development Model Insights

Launched in early 2022 by The Government of Uganda, the Parish Development Model(PDM) was initiated as a strategy to tackle the persistent subsistence economy in mostly rural administrative parishes or wards as a starting point for planning, budgeting and delivering public services. The initiative renders the devolution work for development, financial and social inclusion at the national level, and growth-enhancing economic transformation more broadly [4]. Through Parish Development Model is a scheme designed to move the estimated 39% subsistence households to monetary economy.

According to the latest data from the Parish Development Model Secretariat at the Office of the Prime Minister, 10,589 Parish Development Savings and Credit Cooperative Societies(SACCO) have been established across 177 districts and by the end of October 2024, an accumulated sum of UGX 2.197 Trillion had been disbursed benefitting over 1.85 Million People (PDM National Status Report as of 30/10/2024). The report further highlights that livestock mainly goats, dairy cattle and piggery has benefitted from 39% of the fund model second to crops mainly coffee, maize, cassava, vegetables at 42% amongst others.

1.3. Background of the Study

In 2020, Africa was home to 4.6%(44 million) of the global pig's population [5]. A total of 4.2 Million pigs in Uganda provides livelihood options for over one million households [6]. The piggery sub-sector provides up to 12% of the total livestock sector representing 3% of the total agricultural GDP in Uganda [7]. Pigs ability to feed on many crops and animal products as well as waste makes it a sustainable provider of protein inspite of the problems created by climate change upon having shorter gestation periods and rapid multiplication rates [8].

Several hundreds of households in Lango sub-region in Northern Uganda have set up PDM facilitated smallholder piggery enterprises while utilizing the intensive technique to raise the pigs. Used as an aid to absorbing household food productivity shortfalls, smallholder piggery serves as a source of meat protein, household income and asset [9]. PDM has enhanced interests in piggery enterprises because the beneficiaries and the government consider that piggery is one of the magic bullets for enhanced household food, nutrition and income security considering that it has limited barriers to entry due to comparatively reasonable capital required for establishment.

1.4. Problem Statement

The Parish Development Model (PDM) funds have been utilized to support various enterprises, including piggery, coffee, maize, cassava, bananas, goat rearing, beef and dairy cattle, beans, vegetables, and sheep farming. However, the characteristic large family households in Lango sub-region homesteads coupled with low educational attainment makes smallholder piggery easily attractive to the above category of households as a form of informal employment to cater for their families [10].

Because of limited land requirements for the venture, it is one of the reasons that poor household adopt it as a household income generating activity [11]. The production process in piggery is more accommodative to women based on limited space requirements and barriers to entry compared to other livestock. Women provide much of needed labor in the production processes [12], [13]. The choice for beneficiaries of PDM piggery enterprise support included; level of poverty, knowledge and competency in piggery, overwhelming motivation to start or sustain a piggery enterprise and agreeing to PDM beneficiary guidelines.

However, what remains at stake is to rigorously assess smallholder piggery enterprise contribution in empowering women beneficiary's households two years down the road. There are numerous other pillars of the parish development model, however the study aims to revisit the outcomes of one of the pillars to determine whether its descending towards the endpoint of previous development models.

Therefore, the study is an evaluation of the impact of the parish development model on female beneficiary's socio-

economic development two years since benefitting from the Parish Development Model(PDM) Financial Inclusion Pillar. Secondly, there are scarce, if any, published literature or studies in regards to the impact of PDM financial inclusion pillar, with especial reference on smallholder piggery enterprise, on the beneficiaries. The study result will assist in prioritization, provision of feedback to research and guide policy makers and stakeholders involved in the process of designing and implementing maiden development models.

2. Related Work

Related study revealed moderate success in the aftermath of the implementation of varying interventions and relevant schemes by the government with the aim of uplifting the socio-economic status and livelihoods of pig farmers in the study area [14]. Another previous study also found out that 58% of the study sample agreed that piggery enterprises are a source of meat and household income. Other benefit accrued include manure which broadens livelihood portfolio. Overall the respondents of the study contend that income from the piggery enterprise had led to economic empowerment of the local community because it creates opportunities like the initiation of Rotating Savings and Credit Association-ROSCAS [15].

In another related study, beneficiaries revealed that piggery projects provided food for their families with up to 19% responding that piggery is their only source of income. The study avers that piggery is one of the recommended strategies to create employment hence raising the living standards amongst the local community. It further concludes that the government played a crucial role through intervention for the sustainability of piggery enterprises [16]. In another study it was established that, after the government provided assistance programs through the provision of pigs as brood stock to the smallholder farmers, piggery enterprises were able to provide significant income with an average ownership of 26 pigs/piggery per farmer, contributing 40% of the household income while other farming business contributed 38% and the non-farm business contributed 22%. It was also found out that there is need for farmers to increase the number of exotic breed pigs owned to increase household income [17].

In a study conducted in East Africa, evidence therein linked pig husbandry to reduction in poverty levels amongst the families studied in respect to income. It was found out that pig farming significantly enhances quality of life and creates jobs as well [18]. For piggery to play an important role in the wellbeing of the communities, there is need for poverty relief programs and promotions of pig production. In another related work, the annual income from backyard piggery contributed about 31% to the total annual family income. The study further recommends that the future of piggery farming appears to be bright with better marketing, improved access to credit and training on improved pig husbandry practices are likely to boost the profitability of pig production [19].

In another study conducted to determine the profitability of pig farming, findings indicated that pig farming was a profitable enterprise after having recorded a positive net farm income and a return on investment. The study recommended that more funds should be channeled into piggery enterprises to increase productivity in pig husbandry [20]. Piggery enterprises yielded substantial employment generation for family and hired labor. Despite the challenges including the Corona virus pandemic, piggery enterprises remained resilient and is a promising alternative income generating activity as concluded by a similar study [21].

Parish Development Model financial inclusion pillar is implemented through the provision of an interest free loan from the Government of Uganda. The loan has a grace period of over one year and obtained with minimum transaction expense that is why it is relatively effective. A related study conducted in the sub-region revealed that when transaction expenses are reduced on loans and that the interest rates are low and flexible characterized by reasonable grace periods then it is possible for many farmers to easily access agricultural financing [22]. Related to the above study is that the government of the study area has initiated various poverty eradication programmes in both rural and urban areas and achievements has been remarkable especially through facilitating self-employment interventions [23].

3. Theory/Calculation

3.1. The Path Model

The work has adopted the path model to determine the relationships amongst the variables in the research. The chosen model is a statistical tool used in project evaluation and research to explore the relationships among independent, moderating and dependent variables in order to identify the drivers and predictors of the outcomes [24]. The model tests hypothesis related to the project outcomes.

The key steps in the model are: -

i. Identify variables related to the project being evaluated,
ii. Hypothesis postulation,
iii. Analysis and determination of coefficients through parametric or non-parametric test. In this study, the non-parametric chi squared test is used.

3.2. The Chi Square Test and Test Formula

Chi squared test is used in various statistical procedures to help to decide if to hold onto or reject the hypothesis. The test differentiates between the observed value and expected value. The chi- test also returns a *P*-value. The smaller the *p*-value the stronger the evidence for rejection of the null hypothesis. Below is the chi squared test

$$\chi^2=\sum \frac{(0_i-E_i)^2}{E_i}$$

Where

Σ = Sum of

0_i= Observed Value (Actual Value)

E_i= Expected Value

When the collected data matches the expected data the test returns a small chi squared test value, meanwhile a very large one is indicative of the collected data not matching the expected data, hence the null hypothesis is rejected (The alternative is accepted). In this study, null hypothesis is when there is no association.

4. Experimental Method/Procedure/Design

4.1. Conceptual framework

From the literature review, the study proposed a conceptual framework to organize and direct the research. The conceptual framework adopted later on illustrates that intensive piggery enterprises is contributory to positive social and economic impacts. The former is envisaged to include the ability to meet the households need ranging from education, health, food, nutrition, household assets and others, while the later may include income through sales of pigs, piglets, boar services, manure and employment amongst others.

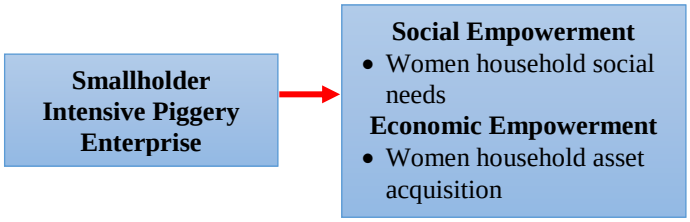

Figure 1: Conceptual Framework

4.2. Hypothesis Postulation

Objective of the Study:

The objective of the study is to evaluate the socio-economic impact of smallholder piggery enterprise on PDM beneficiary women households.

Specific Objective 1:

To determine the impact of piggery enterprise on beneficiary women household asset acquisition

Hypothesis 1:

From the above first specific objective of the study, the corresponding hypotheses are postulated:

Null Hypothesis 1a:

There is no positive relationship between smallholder piggery enterprise and beneficiary women household asset acquisition

Alternative Hypothesis 1b:

There is a positive relationship between smallholder piggery enterprise and beneficiary women household asset acquisition

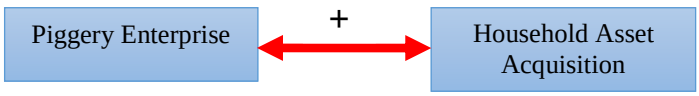

Figure 2: Hypothesis 1(a and b)

Specific Objective 2:

To assess the role of piggery enterprise in facilitating the meeting of beneficiary women household social needs.

Null Hypothesis 2a:

There is no positive relationship between piggery enterprise and meeting of beneficiary women household social needs.

Hypothesis 2b:

There is a positive relationship between piggery enterprise and meeting of beneficiary women household social needs.

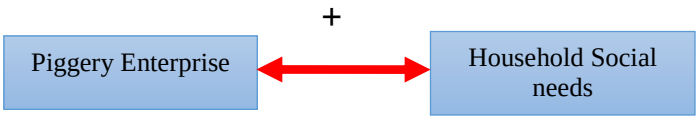

Figure 3: Hypothesis 2(a and b)

4.3. Materials and Methods

Study design

The study adopted a descriptive community based cross-sectional study because the result is easily generalized, easy and quick to be conducted over a very short period of time and inexpensive [25]. Results from a cross-sectional study like this very study, is used in the planning other research studies and policy improvement. It was adopted to measure the outcome of the parish development model piggery project socio-economic support to the women households two years after accessing the financing.

Population and Sample size

The study accessed a list of Parish Development Model piggery enterprise women beneficiaries from the respective parish development committees of the two districts of Lira and Kole. Lira District has 89 Parishes/Wards while Kole district has 41 parishes. A total of 65 women who had benefitted from PDM to facilitate piggery enterprise from the two districts were selected as Lira District (45) and Kole District (20). Therefore, the study sample size was 65 smallholder women piggery entrepreneurs. 5 questionnaires were graded as not good for further analysis thereby reducing the questionnaires fit for analysis was reduced to 60 which is 92%.

Data Collection

The community survey data collection was conducted in the purposively selected parishes in the two districts targeting the identified PDM piggery enterprises beneficiaries. The research data collection method was solely questionnaire surveys, with undocumented conversation. Research assistants administered the questionnaire to all the respondents after piloting for face validity. The questionnaire used predominantly closed ended questions on demographic and socio economic questions. Primary data were used for the study and were sourced from the respondents through the use of questionnaire.

Prerequisite Tests and Analysis

A Cronbach Alpha value of 0.64 of the validity and reliability of the questionnaire was confirmed through Cronbach Alpha method. Normality and linearity tests was conducted at a significance level of 5%. For all of the statistical tests used in this study, the significant level was set at *p*-value of less than 5%.

5. Results and Discussion

5.1. Descriptive Statistics

Table 1: Level of Education

	Frequency	Percent	Cumulative Percent
Never Attended School	13	21.7%	21.7%
Primary Education	33	55.0%	76.7%
Secondary	11	18.3%	95.0%
Tertiary	3	5.0%	100.0%
Total	60	100.0%	

Nearly Four fifth (78.3%) of the respondents are literate which is a reflection of the national average which recorded 76% for adults in the year 2022 Uganda National Demographic Survey. On the other hand, the significant number of tertiary educated respondents (5%) is also reflection of the current trends whereby the agricultural sector is becoming attractive for the educated as well.

Table 2: Number of People in Households

	Frequency	Percent	Cumulative Percent
1-3	14	23.3%	23.3%
4-6	31	51.7%	75.0%
>6	15	25.0%	100.0%
Total	60	100.0%	

The national average of the number of people per household as recorded during the 2022 housing and demographic survey averages 4.6 persons. In this study, more than one half (51.7%) of the respondents had between 4 to 6 household members which is in agreement with the above national average.

Table 3: Marital Status

	Frequency	Percent	Cumulative Percent
Married	24	40.0%	40.0%
Cohabiting	7	11.7%	51.7%
Separated/Divorced	19	31.7%	83.3%
Single	8	13.3%	96.7%
Widow	2	3.3%	100.0%
Total	60	100.0%	

Two fifth of the respondents (40%) are married, 11.7% are cohabiting and a significantly concerning 31.7% are separated or divorced. Therefore, it's safe to estimate that atleast 71.7% of the respondents are married or have ever been married. The widows number 3.3% while the single are 13.3%.

Table 4: Age of Respondent

	Frequency	Percent	Cumulative Percent
18-25	17	28.3%	28.3%
26-35	29	48.3%	76.7%
36-45	7	11.7%	88.3%
46-55	5	8.3%	96.7%
>55	2	3.3%	100.0%
Total	60	100.0%	

76.7% of the respondents are aged between 18 and 35 years old. This in agreement with the national average that indicates that the youth population in Uganda is nearly 80%.

Table 5: Source of Income Before the Piggery Enterprise

	Frequency	Percent	Cumulative Percent
Subsistence Farming	43	71.7%	71.7%
Paid Farm Labor	7	11.7%	83.3%
Small Scale Business	10	16.7%	100.0%
Total	60	100.0%	

71.7% of the respondents were subsistence farmers in agreement with the criteria for benefitting from the Parish Development Model(PDM) that targets those in subsistence economy.

Table 6: Number of Pigs Owned

	Frequency	Percent	Cumulative Percent
1-5	25	41.7%	41.7%
6-10	29	48.3%	90.0%
11-15	2	3.3%	93.3%
16-20	2	3.3%	96.7%
21-25	1	1.7%	98.3%
>25	1	1.7%	100.0%
Total	60	100.0%	

90% of the beneficiaries own not more than 10 pigs with majority (48.3%) owning between 6-10 pigs per beneficiary. Closely following them are those owning between 1-5 pigs at 41.7%. This seemingly predominantly fewer herd can be attributed to the natural reaction of the respondents in the face of mounting feed and medical costs. Only 6.7% of the respondents own between 16 and over 25 pigs. These categories can be described as the progressive piggery enterprise bracket whose possible trajectory will culminate into medium and large scale piggery enterprise.

Table 7: Number of Years in Piggery Enterprise

	Frequency	Percent	Cumulative Percent
1-2	34	56.7%	56.7%
3-5	16	26.7%	83.3%
> 5	10	16.7%	100.0%
Total	60	100.0%	

Atleast 43.3% of the beneficiaries were already in the piggery enterprise while more than a half (56.7%) initiated the piggery enterprise after support from the PDM. It is also worth noting that the funding increased piggery enterprises by 56.7% in the rural areas.

Table 8: Earnings over the Past two years from Piggery Products

	Frequency	Percent	Cumulative Percent
<400,000	4	6.7%	6.7%
400,001-600,000	7	11.7%	18.3%
600,001-1,000,000	23	38.3%	56.7%
1,000,001-1,700,000	14	23.3%	80.0%
1,700,001-2,000,000	10	16.7%	96.7%
> 2,000,000	2	3.3%	100.0%
Total	60	100.0%	

Despite the catastrophe that struck some of the beneficiaries who lost their herd (6.7%) shortly after start-up and earned less than UGX 400,000 only so far, 93.3% earned between UGX 400,000 to UGX 2,000,000 over the period with 38.3% earning between UGX 600,000-UGX1,000,000. An encouraging 23.3% earned between UGX 1,000,000 to UGX1,700,000 and 20% earning between UGX1,700,000 and over UGX2,000,000.

Table 9: Serious Illness affecting Piggery Enterprise

	Frequency	Percent	Cumulative Percent
Strongly Agree	30	50.0%	50.0%
Agree	13	21.7%	71.7%
Neutral	11	18.3%	90.0%
Disagree	6	10.0%	100.0%
Total	60	100.0%	

71.7% agree that illness is the most serious challenge to the enterprise with a puzzling 10% disagreeing. The disagreement amongst some of the respondents is matter of importance because it reflects the lack of knowledge and skills about the impact of livestock diseases on the income from the enterprise.

Table 10: Access to Quality Vaccines

	Frequency	Percent	Cumulative Percent
Strongly Agree	17	28.3%	28.3%
Agree	19	31.7%	60.0%
Neutral	21	35.0%	95.0%
Disagree	3	5.0%	100.0%
Total	60	100.0%	

It is no surprise that the 5% to the previous findings in regards to disagreement to the threat of illness in the piggery enterprise, maintained that access to quality vaccine is not critical to the output of the enterprise. Another area of concern is the significant rise in the number of respondents who are neutral this is also attributed to the lack of knowledge on the importance of vaccines and possibly less frequent visit to the livestock and poultry drug shops to assess the cost of various essential drugs i.e. never provide adequate treatment to the animals.

Table 11: Feed Prices

	Frequency	Percent	Cumulative Percent
Strongly Agree	50	83.3%	83.3%
Agree	7	11.7%	95.0%
Neutral	0	0%	95.0%
Disagree	3	5.0%	100.0%
Total	60	100.0%	

95% of the respondents agree that feed prices are a great challenge. The 5% who are in disagreement are predominantly those who lost their pig herds in the early days of the project. There is no respondent who is ignorant of the burden of feeds.

Table 12: Adulterated Feed

	Frequency	Percent	Cumulative Percent
Strongly Agree	20	33.3%	33.3%
Agree	33	55.0%	88.3%
Neutral	4	6.7%	95.0%
Disagree	3	5.0%	100.0%
Total	60	100.0%	

88.3% of the respondents agree that current feeds in the market is adulterated. This also reflects the safety and quality concerns that is increasingly disturbing especially in the human and poultry and livestock drugs and feeds due to relatively weak enforcement of quality assurance in the nation.

Table 13: Start-up Capital

	Frequency	Percent	Cumulative Percent
Strongly Agree	13	21.7%	21.7%
Agree	11	18.3%	40.0%
Neutral	15	25.0%	65.0%
Disagree	21	35.0%	100.0%
Total	60	100.0%	

40% agree that the piggery enterprise requires significant start-up capital while one quarter(neutral) of the respondents have no idea possible due to the support by the government. A significant number disagree about the start-up capital all the same is still due to the cushioning by the government funds.

Table 14: Production of Pork Contributes to Food and Nutrition

	Frequency	Percent	Cumulative Percent
Strongly Agree	17	28.3%	28.3%
Agree	19	31.7%	60.0%
Neutral	13	21.7%	81.7%
Disagree	11	18.3%	100.0%
Total	60	100.0%	

28.3% strongly agree that pork contributes to food and nutrition of the households and another 31.7% agree to the fact. The pork traders purchase the spent swine and other pigs that are being culled for slaughtering and sold as pork within the local community or transported by the traders to other major towns in Uganda. The PDM beneficiaries once again purchase the pork from these traders. Previous studies on pig production found out that whereas piggery enterprise is an important livelihood for the small scale farmers, the pork value chain remains weak [26].

Table 15: Production of Piglets, Boar Services and Spent Swine Contribute to Household Income

	Frequency	Percent	Cumulative Percent
Strongly Agree	43	71.7%	71.7%
Agree	9	15.0%	86.7%
Neutral	6	10.0%	96.7%
Disagree	2	3.3%	100.0%
Total	60	100.0%	

71.7% strongly agree that sales of piglets, revenue from boar services and disposal of spent swine contribute to household income because they are major piggery enterprise products from the smallholder households. Boar services are common for the clients who always acquire piglets from the piggery enterprises. The services are either through cash or provision

of a piglet to the owner of the boar. In related studies it was found out that most households studied prefer receiving immediate cash from selling piglets, and obtaining a larger income from selling slaughter hogs and spent swine at a later date [27].

Table 16: Income from Piggery Contributing to Meeting Health Needs

	Frequency	Percent	Cumulative Percent
Strongly Agree	30	50.0%	50.0%
Agree	13	21.7%	71.7%
Neutral	11	18.3%	90.0%
Disagree	6	10.0%	100.0%
Total	60	100.0%	

Significantly, 71.7% of the beneficiaries accept that piggery enterprise income contribute to meeting the health needs of the households. It can be deduced that the majority of the respondents agree that piggery enterprise is contributory to their improved socio-economic situation.

Table 17: Income from Piggery Contributing to Meeting Educational Needs

	Frequency	Percent	Cumulative Percent
Strongly Agree	38	63.3%	63.3%
Agree	8	13.3%	76.7%
Neutral	11	18.3%	95.0%
Disagree	3	5.0%	100.0%
Total	60	100.0%	

A much higher percentage of 76.7% of the PDM beneficiaries agree that the income from the enterprise contribute to meeting educational needs. The findings reflect the priority areas of the households due to the current sustained advocacy on education in the households and its costs as well.

Table 18: Income from Piggery Contributing to absorbing Climate Change Shock

	Frequency	Percent	Cumulative Percent
Strongly Agree	39	65.0%	65.0%
Agree	16	26.7%	91.7%
Neutral	3	5.0%	96.7%
Disagree	2	3.3%	100.0%
Total	60	100.0%	

91.7% of the respondents agree that piggery enterprise is enhancing climate change resilience in the households. Every now and then when the household sell piglets, there is that opportunity for the households to purchase the much needed food items whose shortage is created by crop failure due to adverse effects of climate change.

Table 19: Tangible Assets Acquired with Piggery Enterprise

	Frequency	Percent	Cumulative Percent
None	3	5.0%	5.0%
Savings	21	35.0%	40.0%
Pig Stock Increase	14	23.3%	63.3%
Land	2	3.3%	66.7%
Building	1	1.7%	68.3%
Motorcycle	1	1.7%	70.0%
Others(Telephone, Bicycles etc.)	18	30.0%	100.0%
Total	60	100.0%	

Savings activities predominate women household alternative income generation strategies through membership in the village savings and loans association. One of the key challenges that face the participants of the village savings and loans association activities is routine funds to meet the savings obligations. It is no surprise that 35% of the respondents channel their earnings towards savings activities because the women households have limited resources to be saved. A significant 30% utilize the earnings to cater for household communications and transport needs which are important in the day to day life by acquiring amongst others, bicycles and cell phones. 23.3% provide for increase in their piggery enterprise herd size.

Table 20: Significant Household Need Supported by Piggery Enterprise

	Frequency	Percent	Cumulative Percent
School Fees	12	20.0%	20.0%
Health Needs	9	15.0%	35.0%
Purchase of Food	19	31.7%	66.7%
Savings Activities	11	18.3%	85.0%
Purchase of Agro Inputs	9	15.0%	100.0%
Total	60	100.0%	

Still, 18.3% of the earning from the piggery enterprise is saved and 31.7% is used to purchase food items in their respective households. A substantial 20% channelled to meet the educational requirements of the households.

Table 21: Whether Piggery Enterprise has empowered them Socially and Economically

	Frequency	Percent	Cumulative Percent
Yes	56	93.3%	93.3%
No	4	6.7%	100.0%
Total	60	100.0%	

In an apparent recognition for its role in enhancing household resilience in response to climate change shock, a corresponding 93.3% agree that piggery enterprise has empowered them socially and economically. 91.7% previously had attested that the piggery enterprise had contributed in supporting the household absorb climate change shock. The study can conclude that this has been as a result of the parish development model support to the women households. In related studies, it was found out that women development fund significantly improved the livelihoods of women and their households through income generation leading to improved living conditions [28].

5.2. Non-Parametric Test

The aim of the study was to explore how Piggery enterprise factors (number of pigs owned, years in piggery enterprise and earnings over the past two years from piggery products) predict tangible assets acquired and most significant household need supported with the piggery enterprise which are determinants of socio-economic development.

The Chi Squared Test:

Null Hypothesis 1a:

There is no positive relationship between smallholder piggery enterprise and beneficiary women household asset acquisition

Alternative Hypothesis 1b:
There is a positive relationship between smallholder piggery enterprise and beneficiary women household asset acquisition

5.2.1. Hypothesis Testing:
To explore how Piggery enterprise factors (number of pigs owned, years in piggery enterprise and earnings over the past two years from piggery products) are associated with tangible assets acquired with the piggery enterprise which is a determinant of socio-economic development.

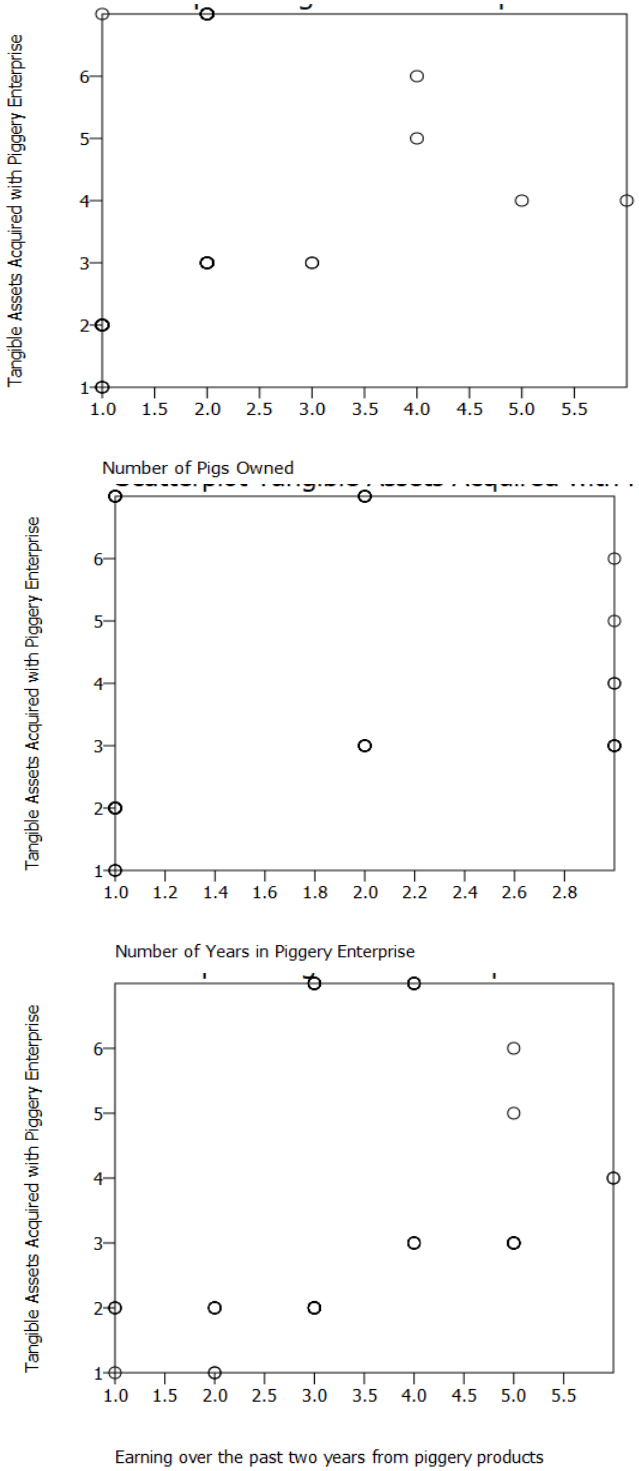

Figure 4: Scatterplot for Hypothesis 1

The scatter plot (number of pigs owned) shows lack of linear correlation between tangible assets acquired from piggery enterprise and number of pigs owned with a lot of incidences of outliers in the data. Therefore, the data do not qualify for multilinear regression analysis. The scatter plot for earnings over the past two years also exhibit lack of linearity between tangible assets acquired from piggery enterprise and earnings over the past two years from the piggery enterprise products with marked outliers. The chi-squared test tests the hypothesis that there is no linear relationship between two categorical variables.

Observed Frequencies

- Number of Pigs Owned (a)- 1-5**(25)** (b) 6-10**(29)** (c) 11-15**(2)** (d) 16-20**(2)** (e) 21-25 **(1)** (f) Over 25**(1)**
- Years in Piggery Enterprise (a)- 1-2 Years **(34)** (b) 3- 5 Years **(16)** (c) Over 5 Years **(10)**
- Earnings from piggery enterprise over the past two years(a)Under UGX 400,000**(4)**(b) UGX 400,001- UGX 600,000**(7)** (c) UGX 600,001- UGX 1,000,000**(23)** (d) UGX 1,000,001- UGX 1,700,000**(14)** (e) UGX 1,700,001- UGX 2,000,000**(10)** (e) Over UGX 2,000,000**(2)**
- Tangible asset acquired since receiving PDM Funds(a)- None **(3)** (b) Savings **(21)** (c) Pig Stock Increase **(14)** (d) Land **(2)** (e) Building **(1)** (f) Motorcycle **(1)** (g) Other (Bicycle, telephones etc.) **(18)**
- most significant household need met from the piggery sales (a)- Payment of School Fees **(12)** (b) Cater for Health Needs **(9)** (c) Support in the buying of food **(19)** (d) Supports in my Savings Activities **(11)** (e) Other agricultural activities (Buying seeds and other inputs) **(9)**

Chi-Square Test Results

Table 22: Chi-Square Tests- Number of Pigs Owned × Tangible Assets Acquired with Piggery Enterprise

	Value	Degrees of freedom	Asymptotic Sig. (2-tailed)
Pearson Chi-Square	180.80	30	0.000
Likelihood Ratio	107.55	30	0.000
Linear-by-Linear Association	8.94	1	0.003
N of Valid Cases	60		

Table 23: Symmetric Measures

		Value
Nominal by Nominal	**Phi**	1.74
	Cramer's V	0.78
N of Valid Cases		60

The Chi-Square Statistic **(χ^2)** value of the above is 180.80 and the degree of freedom(df) is 30. The p-value being less than 0.05(p=0.000) indicates a statistically significant association between number of pigs owned and tangible assets acquired with the piggery enterprise. The effect size of 0.78(Cramer's V), is statistically significant, is on the bigger side, suggesting that the number of pigs owned has huge impact on tangible assets acquired.

Table 24: Chi-Square Tests- Number of Years in Piggery Enterprise × Tangible Assets Acquired with Piggery Enterprise

	Value	Degrees of freedom	Asymptotic Sig. (2-tailed)
Pearson Chi-Square	62.06	12	0.000
Likelihood Ratio	72.90	12	0.000
Linear-by-Linear Association	1.29	1	0.256
N of Valid Cases	60		

Table 25: Symmetric Measures

		Value
Nominal by Nominal	**Phi**	1.02
	Cramer's V	0.72
N of Valid Cases		60

The Chi-Square Statistic (χ^2) value of the above is 62.06 and the degree of freedom(df) is 12 while the statistical significance(p-value) being is less than 0.05(p=0.000) indicates an association between number of years in piggery enterprise and tangible assets acquired. The Cramer value of 0.72 indicating a strong association between the variables.

Table 26: Chi-Square Tests- Earning over the past two years from piggery products × Tangible Assets Acquired with Piggery Enterprise

	Value	df	Asymptotic Sig. (2-tailed)
Pearson Chi-Square	134.23	30	0.000
Likelihood Ratio	99.87	30	0.000
Linear-by-Linear Association	4.93	1	0.026
N of Valid Cases	60		

Table 27: Symmetric Measures

		Value
Nominal by Nominal	**Phi**	1.50
	Cramer's V	0.67
N of Valid Cases		60

The Chi-Square Statistic **(χ^2)** value of the above is 134.23 and the degree of freedom(df) is 30. The p-value being less than 0.05(p=0.000) indicates a statistically significant association between earnings earned in the past two years and tangible assets acquired with the piggery enterprise. The effect size of 0.67(Cramer's V), is statistically significant, is on the bigger side, also suggesting that the earnings earned in the past two years has huge impact on tangible assets acquired.

5.2.2. Hypothesis Testing

To explore how Piggery enterprise factors (number of pigs owned, years in piggery enterprise and earnings over the past two years from piggery products) are associated with most significant household need supported with the piggery enterprise which is a determinant of socio-economic development.

Null Hypothesis 2a:

There is no positive relationship between piggery enterprise and meeting of beneficiary women household social needs.

Hypothesis 2b:

There is a positive relationship between piggery enterprise and meeting of beneficiary women household social needs.

The scatter plot (number of pigs owned) shows lack of linear association between meeting of women household social and economic needs from piggery enterprise and number of pigs owned with a lot of incidences of outliers in the data. Therefore, the data is inappropriate for conducting multilinear regression analysis. The scatter plot for earnings over the past two years also exhibit lack of linearity between meeting of women household social needs from piggery enterprise and earnings over the past two years from the piggery enterprise products with marked outliers. The number of years in piggery enterprise has no linearity. Therefore, further analysis will be conducted using the chi squared test.

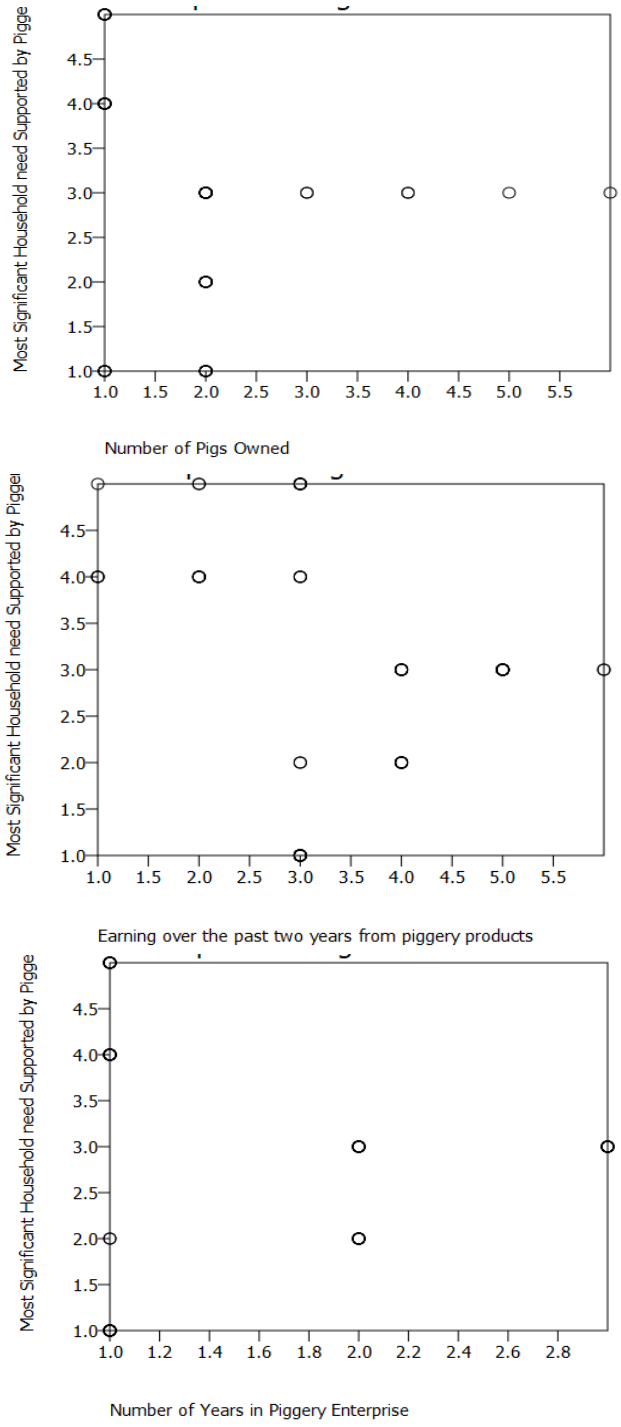

Figure 5: Scatterplot for Hypothesis 2

Observed Frequencies

- Number of Pigs Owned (a)- 1-5(25) (b) 6-10(29) (c) 11-15(2) (d) 16-20(2) (e) 21-25 (1) (f) Over 25(1)
- Years in Piggery Enterprise (a)- 1-2 Years (34) (b) 3- 5 Years (16) (c) Over 5 Years (10).
- Earnings from piggery enterprise over the past two years (a)Under UGX 400,000(4) (b) UGX 400,001- UGX 600,000(7) (c) UGX 600,001- UGX 1,000,000(23) (d) UGX 1,000,001- UGX 1,700,000(14) (e) UGX 1,700,001- UGX 2,000,000(10) (e) Over UGX 2,000,000(2).
- Tangible asset acquired since receiving PDM Funds(a)- None (3) (b) Savings (21) (c) Pig Stock Increase (14) (d) Land (2) (e) Building (1) (f) Motorcycle (1) (g) Other (Bicycle, telephones etc.) (18).
- Most significant household need met from the piggery sales (a)- Payment of School Fees (12) (b) Cater for Health Needs (9)(c) Support in the buying of food (19) (d) Supports in my Savings Activities (11) (e) Other agricultural activities (Buying seeds and other inputs) (9)

Chi-Square Test Results

Table 28: Number of Pigs Owned × Most Significant Household Need Supported by Piggery Enterprise

	Value	df	Asymptotic Sig. (2-tailed)
Pearson Chi-Square	57.42	20	0.000
Likelihood Ratio	73.57	20	0.000
Linear-by-Linear Association	3.87	1	0.049
N of Valid Cases	60		

Table 29: Symmetric Measures

		Value
Nominal by Nominal	**Phi**	0.98
	Cramer's V	0.49
N of Valid Cases		60

The Chi-Square Statistic **(χ^2)** value of the above is 57.42 and the degree of freedom(df) is 20. The p-value being less than 0.05(p=0.001) indicates a statistically significant association between number of pigs owned and most Significant Household Need Supported by Piggery Enterprise. The effect size of 0.49(Cramer's V), is statistically significant, is on the bigger side, suggesting that the number of pigs owned has huge impact on the most Significant Household Need Supported by Piggery Enterprise.

Table 30: Chi-Square Tests- Number of Years in Piggery Enterprise × Most Significant Household Need Supported by Piggery Enterprise

	Value	df	Asymptotic Sig. (2-tailed)
Pearson Chi-Square	65.24	8	0.000
Likelihood Ratio	80.93	8	0.000
Linear-by-Linear Association	0.35	1	0.554
N of Valid Cases	60		

Table 31: Symmetric Measures

		Value
Nominal by Nominal	**Phi**	1.04
	Cramer's V	0.74
N of Valid Cases		60

The Chi-Square Statistic (χ^2) value of the above is 65.24 and the degree of freedom(df) is 8. The p-value being is less than 0.05(p=0.001) indicates an association between number of years in piggery enterprise and most Significant Household Need Supported by Piggery Enterprise. The Cramer value of 0.74 indicating a strong association between the variables.

Table 32: Chi-Square Tests- Earning over the past two years from piggery products × Most Significant Household Need Supported by Piggery Enterprise

	Value	df	Asymptotic Sig. (2-tailed)
Pearson Chi-Square	94.54	20	0.000
Likelihood Ratio	101.93	20	0.000
Linear-by-Linear Association	3.98	1	0.046
N of Valid Cases	60		

Table 33: Symmetric Measures

		Value
Nominal by Nominal	**Phi**	1.26
	Cramer's V	0.63
N of Valid Cases		60

The Chi-Square Statistic (χ^2) value of the above is 94.54 and the degree of freedom(df) is 20. The p-value being less than 0.05(p=0.001) indicates a statistically significant association between earnings earned in the past two years and Most Significant Household Need Supported by Piggery Enterprise. The effect size of 0.63(Cramer's V), is statistically significant, is on the bigger side, suggesting that the earnings earned in the past two years has huge impact on Most Significant Household Need Supported by Piggery Enterprise.

The non-parametric test explored how Piggery enterprise factors predict tangible assets acquired and most significant household need supported with the piggery enterprise which are determinants of socio-economic development.

Table 34: Non Parametric Tests Results Summary

Test Item	Pearson Chi Square	DF	Cramer's V	Asymptotic Sig. (2-tailed)
Number of Pigs Owned × Tangible Assets Acquired	180.80	30	0.78	0.000
Number of Years in Piggery Enterprise × Tangible Assets Acquired	62.06	12	0.72	0.000
Earning over the past two years from piggery products × Tangible Assets Acquired	134.23	30	0.67	0.000
Number of Pigs Owned × Most Significant Household Need Supported	57.42	20	0.49	0.000
Number of Years in Piggery Enterprise × Most Significant Household Need Supported	65.24	8	0.74	0.000
Earning over the past two years from piggery products × Most Significant Household Need Supported	94.54	20	0.63	0.000

6. Conclusion and Future Scope

62% (2.2 million) of Uganda's Households are engaged in subsistence agricultural activities, whereas 38% (1.3 million households) are actively engaged in non-agricultural activities (UNHS 2019/20). It is no surprise that they live on international poverty line of USD 1.9 per day. Despite projects being rolled out by the Government, The International Finance Corporation reiterated that half of its projects in Africa have failed dismally. Despite the challenges, The Parish Development Model(PDM) financial inclusion launched in early 2022 is a strategy to tackle the subsistence economy persistence in mostly rural settings in parishes or wards as a starting point for planning, budgeting and delivering public services.

According to the latest Parish Development Model Secretariat at the Office of the Prime Minister, livestock mainly goats, dairy cattle and piggery has benefitted from 39% of the fund model second to crops mainly coffee, maize, cassava, vegetables at 42% amongst others. Piggery being one of PDM's intervention areas, it is envisaged that will eventually empower the rural communities. Several hundreds of households in Lango sub-region in Northern Uganda have set up PDM facilitated small scale piggery enterprises while utilizing the intensive technique to raise the pigs. There is little published research regarding the impact of Parish Development Model Financial Inclusion Pillar on the beneficiaries whose study result will assist in prioritization, provision of feedback to research and guide policy makers and stakeholders. Therefore, the study is an evaluation of prevailing development models in Africa and in particular the Parish Development Model adopted by Uganda utilizing the path model to determine the relationships between the variables in the research through a descriptive community based cross-sectional study.

78.3% of the respondents are literate which is a reflection of the national average which recorded 76% for adults in the year 2022 Uganda National Demographic Survey. On the other hand, the significant number of tertiary educated respondents (5%) is also reflection of the current trends whereby the agricultural sector is becoming attractive for the educated as well. 76.7% of the respondents are aged between 18 and 35 years old. This in agreement with the national average that indicates that the youth population in Uganda is nearly 80%. 71.7% of the respondents were subsistence farmers in agreement with the criteria for benefitting from the Parish Development Model(PDM) that targets those in subsistence economy. 90% of the beneficiaries own not more than 10 pigs with majority (48.3%) owning between 6-10 pigs per beneficiary. Only 6.7% of the respondents own between 16 and over 25 pigs. Atleast 43.3% were beneficiaries were already in the piggery enterprise while more than a half (56.7%) initiated the piggery enterprise after support from the PDM.

It is also worth noting that the funding increased piggery enterprises by 56.7% in the rural areas. 93.3% earned between UGX 400,000 to UGX 2,000,000 over the period with 38.3% earning between UGX 600,000-UGX1,000,000. An encouraging 23.3% earned between UGX 1,000,000 to UGX1,700,000 and 20% earning between UGX1,700,000 and over UGX2,000,000. 40% agree that the piggery enterprise requires significant start-up capital while one quarter of the respondents have no idea possible due to the support by the government.

28.3% strongly agree that pork contributes to food and nutrition of the households and another 31.7% agree to the fact. 71.7% strongly agree that sales of piglets, revenue from boar services and disposal of spent swine contribute to household income because they are major piggery enterprise products from the smallholder households. Significantly, 71.7% of the beneficiaries accept that piggery enterprise income contribute to meeting the health needs of the households. A much higher percentage of 76.7% of the PDM beneficiaries agree that the income from the enterprise contribute to meeting educational needs.

91.7% of the respondents agree that piggery enterprise is enhancing climate change resilience in the households. Savings activities predominate women household alternative income generation strategies through membership in the village savings and loans association. In an apparent recognition for its role in enhancing household resilience in response to climate change shock, a corresponding 93.3% agree that piggery enterprise has empowered them socially and economically. 91.7% previously had attested that the piggery enterprise had contributed in supporting the household absorb climate change shock. The study can conclude that this has been as a result of the parish development model support to the women households.

Areas for further research is why piggery has failed to become a key household source of income amongst the entrepreneurs. Findings during the survey indicate that most piggery entrepreneurs are in the occupation to raise income and migrate into goat, sheep and cattle rearing.

Data Availability

- Sample used in the study may not reflect the general population of PSM piggery enterprise beneficiaries. There is need for future studies to select samples from different areas of the country or region for a generalized reflection.
- Limitation of a relatively small sample size for precise results. Need to increase sample size to ensure precise results.
- Limited relevant research studies in the government funded piggery enterprises for the women households. There is need for recommending enhanced research in the area especially the role of public support in private piggery enterprises.
- The survey question never addressed the issue of participatory planning especially whether piggery enterprise was recommended after a prefeasibility study or not. Background questions regarding the choice of enterprise needs to be addressed in future studies.

Conflict of Interest
I declare that I do not have any conflict of interest.

Funding Source
None

Authors' Contributions
None

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AUTHORS PROFILE

Okello Olwo Kenneth has 25 (Twenty-Five) years of progressive practical and specialized experience in managing community development Program. I am an innovative with a proven ability to identify and capitalize on project opportunities and I have wider experience in enterprise development. Studied Information Technology at Cavendish University in Uganda. Research Experience includes: World Bank DELVE research assistant and Amolatar District Local Government Agricultural Department individual crop value chain analysis research and data analysis assistant.

