

Operation wealth creation and rural household food security in Ntungamo District: A case of Rugarama sub county. Descriptive cross- sectional survey design.

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Mathius Mujurizi^{1}, Prof. Roberts K Muriisa^{1,2}, Dr. Milton Rwangire¹*

¹Directorate of Graduate Studies, Bishop Stuart University

²Mbarara University of Science and Technology

Abstract

Background

The provision of agricultural inputs plays a crucial role in improving farm productivity and ensuring food security for rural households. Therefore, this study aimed to determine the impact of agricultural input provision on crop yields and food security among rural households in Rugarama sub-county, Ntungamo District.

Methodology

The study employed a descriptive cross-sectional survey design using both quantitative and qualitative approaches. A sample of 141 respondents was selected through simple random and purposive sampling techniques, with data collected using questionnaires and interview guides. Quantitative data were analyzed using SPSS, while qualitative data were analyzed thematically.

Results

130 respondents participated in this study; males were 80 (61.5%), while the females accounted for 50 (38.5%). 25(19.2%), were aged 20-29 years, 40(30.8%) were aged 30-39 years, 35(26.9%), were aged 40-49 years and 30(23.1%) above 50 years. Provision of Agricultural Inputs ($\beta = 0.215$, p-value = 0.001) has a positive and significant effect, indicating that increased input provision leads to higher crop production levels. Provision of Agricultural Inputs ($\beta = 0.192$, p-value = 0.002) has a positive and significant effect on livestock numbers and output. For household food stocks, the provision of Agricultural Inputs ($\beta = 0.182$, p-value = 0.006) significantly increases food stocks. For the food price index, the results show that Provision of Agricultural Inputs ($\beta = 0.152$, p-value = 0.031) significantly affects food prices, with a positive relationship suggesting that agricultural input provision helps stabilize food prices.

Conclusion

Provision of agricultural inputs under Operation Wealth Creation (OWC) has significantly improved food production in Rugarama Sub-County, though its impact is constrained by irregular supply, poor targeting, and inadequate sensitization.

Recommendation

Enhancing the consistency and coverage of OWC services, improving rural infrastructure, and ensuring equitable access to agricultural resources and markets.

Keywords: Agricultural input Provision, Crop Yields, Food Security, Rural Households, Rugarama Sub-Count, Ntungamo District

Submitted: 2025-08-01 Accepted: 2025-08-20 Published: 2025-08-20

Corresponding author: Mathius Mujurizi*

Email: mujuruzimathius@gmail.com

Directorate of Graduate Studies, Bishop Stuart University

Background of the study

Boosting household wealth and welfare is essential for sustainable development globally.

Sustainable development occurs when households can maintain a certain level of well-being without deterioration over time. The latest World Bank recommendations

highlight natural and human resources as key tools for shaping policies for sustainable development.

The agricultural development approach originates from strands of Food Security ideas developed through the 1980s and 1990s (Chambers & Conway, 1992).

According to the World Food Summit Report, food security is defined as existing “when all people at all times have access to sufficient, safe, nutritious food to take care of a healthy and active life”.

In Uganda, Rural Food Security development strategies are undertaken during a series of programs, for instance, District Livelihood Programs, Local Economic Development, National Agricultural Advisory Services, Operation Wealth Creation, and others. In rural areas of Uganda, the poor have skilled economic decline by engaging in a wide selection of local initiatives, and these survivalist activities range from informal trading, business development services, rural agriculture, and value chain production.

The government of Uganda is committed to improving service delivery through effective financing, implementation, and monitoring of programs. The last word aim is to reinforce citizens’ welfare through increased access to basic services, including health, education, water and sanitation, agricultural advisory services, energy, roads, ICT, and microfinance (UBOS, 2011). In Rugarama Sub County in Ntungamo District, the community development officers, agricultural extension officers, parish chiefs, alongside the UPDF personnel, play a functional role within the distribution of agricultural inputs to farmers to support interventions across the worth chain – from production and value addition to agri-business development and marketing.

Uganda began an agricultural transformation programme like PMA, NAADS, and OWC that are aimed towards modernizing agriculture with emphasis on liberalizing agricultural markets, reducing trade barriers, and promoting traditional and nontraditional exports altogether in Districts, including Ntungamo (Kivumbi, 2013).

In Ntungamo District, this transformation was expected to enhance rural food supplies, incomes, increase factor efficiency, and propel national development, since the agriculture sector features a “comparative advantage” by employing 90%-80% of the population within the district. Therefore, this study aimed to determine the impact of agricultural input provision on crop yields and food

security among rural households in Rugarama sub-county, Ntungamo District.

Methodology

Research design

The study employed a descriptive cross-sectional survey design. This approach allowed for the collection of a snapshot of information, providing a comprehensive overview of the research topic at that specific moment. Both quantitative and qualitative approaches were utilized in sampling, data collection, data quality control, and analysis.

Study population

The study involved 200 farmers from five Operation Wealth Creation (OWC) Farmer Groups in Rugarama Sub-County, with 40 farmers selected from each group, as indicated in the Ntungamo District Production Report. It also included three Rugarama Sub-County officials: the Sub-County Chief, the Agriculture Extension Worker, and the LC3 Chairperson. Additionally, six district officials participated, namely, the District OWC Coordinator, District Production Officer, District Environment and Natural Resources Officer (DENRO), District Veterinary Officer (DVO), District Agricultural Officer (DAO), and District Commercial Officer (DCO). This brought the total target population to 209 individuals.

Sample size and selection

The research encompassed 141 participants, selected from the total of 209 individuals in the target population. The determination of the sample size adhered to the tables provided by Krejcie and Morgan (1970). According to these tables, for a population of two hundred (200), a sample size of 132 was recommended. This information guided the selection of OWC Farmers from Rugarama Sub-County who participated in the study. Additionally, for target populations of ten (10) or fewer, all individuals were included in the study. This approach was implemented to ascertain the number of respondents from Rugarama Sub-County officials and Ntungamo District Officials. Specifically, there were three (03) Rugarama Sub-County officials and six (06) Ntungamo District Officials.

Table 1: Showing the target population, sample Size, and sampling techniques

Category	Target population	Sample size	Sampling techniques
OWC Farmers in Rugarama Sub-County	200	132	Stratified Random Sampling
Rugarama Sub-County officials	03	03	Purposive Sampling
Ntungamo District Officials	06	06	Purposive Sampling
Total	209	141	

Source: Ntungamo district local government production report 2024.

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Sampling techniques and procedure

Simple random sampling

Stratified random sampling was employed to select 132 OWC Farmers from five farmer groups in Rugarama Sub-County. Each group comprised forty participants, representing 20% of the total population of OWC farmers in the sub-county. The OWC farmers were categorized into five distinct groups based on factors such as farm size, crop type, and location within the sub-county. These strata encompassed small, medium, and large farms, as well as farmers cultivating staple crops and cash crops. Subsequently, simple random sampling was utilized to ensure that every farmer within each stratum had an equal opportunity of being chosen.

Purposive sampling

This sampling method employed non-random techniques, including quota, purposive, convenient, and snowball sampling. The selection process involved purposefully choosing three (03) officials from Rugarama Sub-County and six (06) officials from Ntungamo District. This decision was grounded in the belief that these individuals possessed specialized knowledge and expertise aligned with the objectives of the study.

Data collection methods

Questionnaire survey

A questionnaire survey was selected for its practicality in efficiently gathering substantial data from a large sample size in a cost-effective manner. Closed-ended questionnaires were preferred as they generated specific responses that were easily analyzable.

Interviewing

Interviews entailed direct face-to-face communication between the interviewer and one interviewee at a time. These interviews specifically involved two categories of respondents: Rugarama Sub-County officials and Ntungamo District Officials.

Documentary review

In the qualitative data analysis, it was imperative to underscore the significance of comprehensive documentation. The secondary data employed in this analysis were drawn from both published and unpublished documents, encompassing a variety of sources such as magazines, newspapers, historical documents, and other published materials like Local Economic Development Programme Reports and District Livelihood Support Programme Reports. This approach was utilized to gather data on OWC from the district, as well as other Food Security programs in Ntungamo District and elsewhere in Uganda.

Data collection instruments

The key data collection instruments used in the study included questionnaires, an interview guide, and a documentary review checklist. The questionnaires were designed to gather quantitative data from participants efficiently. The interview guide facilitated in-depth discussions during face-to-face interviews, allowing the researcher to explore responses in detail. Additionally, the documentary review checklist was utilized to systematically review secondary data sources, ensuring a comprehensive analysis of relevant documents related to the study's objectives.

Questionnaire

The questionnaire was employed on the premise that the variables under study, such as respondents' views, opinions, perceptions, and feelings, cannot be directly observed. For this study, a self-administered questionnaire was utilized to

gather information. There was a single set of questionnaires, with variables measured on a 5-point Likert scale, administered to Agriculture Officials, Livelihood Support Programme Officials, District Officials, and Residents.

Page | 4 Interview guide

Interviews were conducted, which involved a dialogue between the interviewer and interviewee, an organized conversation to collect data on a specific topic. Interviews were selected for their ability to facilitate probing for additional information, seek clarification, and capture the facial expressions of the interviewees.

Documentary review checklist

The documentary review checklist was employed to assess pertinent documentary data. This involved gathering information from published and unpublished documents, such as Local Economic Development Programme Reports and District Livelihood Support Programme Reports. Amin (2005) emphasized that documents are valuable in shaping the research design of subsequent primary research and can offer a benchmark for comparing the results of collected primary data using various methods.

Quality control of data collection

Data quality control techniques ensured that the data collected was valid and reliable. The instruments were first tested to ensure both validity and reliability. This testing involved pilot studies where the questionnaires and interview guides were administered to a small group representative of the target population. Feedback was gathered to identify any ambiguities or issues in the questions, allowing for necessary revisions. Additionally, the reliability of the instruments was assessed using statistical methods, such as calculating Cronbach's alpha, to confirm consistency in responses. These steps were crucial in ensuring that the data collection process produced credible and trustworthy results.

Validity

The validity of the instrument was quantitatively established using the Content Validity Index (CVI). This involved the expert scoring of the relevance of the questions in the instrument about the study variables. The CVI was calculated to ensure the validity of the questionnaire. A panel of experts in agricultural extension services evaluated each question for relevance to the

study's objectives. The following formula was used to determine the CVI:
$$CVI = \frac{\text{Number of items rated relevant}}{\text{Total number of items}}$$

$$CVI = \frac{27}{27} = 1.00$$

The calculated CVI for this questionnaire was 1.00, indicating that the instrument possessed a high level of content validity for measuring the constructs related to Operation Wealth Creation and rural household Food Security.

Reliability

The reliability of the instruments was qualitatively assessed through a pilot test of the questionnaire, aimed at ensuring consistency, dependability, and the ability to collect data relevant to the study's objectives. Following this, a reliability analysis was conducted, and quantitatively, reliability was evaluated using Cronbach's Alpha Reliability Coefficient test. The Cronbach's Alpha statistics indicated that values of 0.9 signify excellent reliability, statistically, the values from 0.8 to 0.9 indicate good reliability, values from 0.7 to 0.8 represent acceptable reliability, values from 0.6 to 0.7 indicate questionable reliability, values from 0.5 to 0.6 are deemed poor reliability, and values below 0.5 are classified as unacceptable.

Data collection procedure

Upon the approval of the research proposal by BSU-REC, the researcher sought an introductory letter from Bishop Stuart University. This letter served as an official communication to introduce the researcher to the relevant authorities in the field during the data collection process. In addition to obtaining this letter, the researcher proactively reached out to the local authorities, including district officials and community leaders, to request permission to conduct the study within their jurisdictions.

The researcher conducted preliminary research to identify key stakeholders and potential respondents for the study. This involved gathering information about the communities and the specific demographic groups that would be relevant to the research objectives. Once the permissions were granted, the researcher planned the logistics for data collection, which included scheduling interviews and distributing questionnaires. The engagement with local authorities not only facilitated smoother access to respondents but also helped establish rapport and trust within the community, which is crucial for collecting accurate and reliable data. Through this careful preparation and outreach, the researcher aimed to ensure a successful

data collection process while adhering to ethical guidelines and respecting the community's norms and values.

Data analysis techniques

The researcher employed both qualitative and quantitative methods for data analysis to ensure a comprehensive understanding of the study's objectives.

Quantitative data analysis

For the quantitative data analysis, the researcher utilized the Statistical Package for Social Sciences (SPSS) software. Both descriptive and inferential statistical methods were applied to examine the data comprehensively.

Descriptive statistics were employed to summarize the data and present key findings. This included the use of frequency tables, percentages, means, and standard deviations, which helped in understanding the distribution of responses and the central tendencies within the data set. These measures provided a clear overview of the respondents' characteristics and the overall trends in the data.

Inferential statistics were also conducted to identify relationships between the variables under investigation. Correlation analysis was performed to explore the strength and direction of the relationships among the variables. In instances where predictions were necessary, regression analysis was employed to assess the effect of independent variables on dependent variables.

Furthermore, significance tests, such as t-tests or ANOVA, were utilized to determine whether there were statistically significant differences between various groups in the study.

Qualitative data analysis

For the qualitative data analysis, thematic analysis was employed to interpret and uncover patterns within the data. This process began with data familiarization, where the researcher transcribed interview data and reviewed responses to become deeply familiar with the content. Following this, the data were systematically coded by identifying key words, phrases, or ideas that reflected the research objectives. Both pre-defined codes (based on the study's objectives) and emergent codes (arising directly from the data) were used.

Once the data were coded, the researcher grouped the codes into broader themes that captured significant patterns and relationships. These themes were aligned with the research questions to provide a deeper understanding of the qualitative aspects of the study. Finally, the themes were interpreted to offer detailed explanations of the findings, helping to contextualize and enrich the quantitative results.

Ethical considerations

The research adhered to ethical principles to ensure credibility, trust, and fairness. Integrity was maintained by avoiding fabrication, falsification, and misrepresentation of data, and by acknowledging the work of other authors. Informed consent was obtained voluntarily from participants through letters detailing the study's purpose, procedures, confidentiality measures, and potential risks and benefits; therefore, all the participants consented to this study.

Anonymity and confidentiality were upheld by protecting participants' identities, securing sensitive information, and explaining the use of tools like cameras and recorders. Justice and beneficence were observed by addressing participants' concerns and ensuring their comfort. Objectivity was maintained by minimizing bias in all stages of the research process, from design to interpretation.

Results

Table 2: Response rate

Category	Number Distributed	Number Completed and Returned	Response Rate (%)
Questionnaires (OWC Farmers)	141	130	92.2%
Interviews (Sub-County Officials)	Targeted	All conducted successfully	100%

The results in Table 2 show that out of 141 questionnaires distributed to OWC farmers, 130 were completed and returned, yielding a response rate of 92.2% this indicates a high level of engagement among the farmers surveyed. Additionally, all targeted interviews with sub-county officials were successfully conducted, resulting in a 100% response rate. This complete participation from the

officials further emphasizes the commitment to the study, suggesting that both farmers and officials are actively involved in the agricultural extension services, thereby providing a robust dataset for analyzing the effects of these services on rural household Food Security.

Demographic characteristics of respondents

Table 3: Demographic characteristics of respondents

Characteristic	Frequency (n=130)	Percentage (%)
Gender		
Male	80	61.5
Female	50	38.5
Age		
20-29 years	25	19.2
30-39 years	40	30.8
40-49 years	35	26.9
Over 50 years	30	23.1
Education Level		
Primary education	60	46.2
Secondary education	40	30.8
Tertiary education	20	15.4
Informal education	10	7.6
Marital Status		
Married	90	69.2
Single	20	15.4
Divorced	10	7.7
Separated	5	3.8
Widow	5	3.8

Source: field data, 2025

The results in Table 3 show that among the 130 respondents, the males were 80 (61.5%), while the females accounted for 50 (38.5%). In terms of age, 25(19.2%), were aged 20-29 years, 40(30.8%) were aged 30-39 years, 35(26.9%), were aged 40-49 years and 30(23.1%). Were over 50 years, regarding education levels, 60 (46.2%) held a Primary education, 40(30.8%) had a Secondary education, 20(15.4%) had a tertiary education, and 10 had an Informal education degree (7.6%). In terms of marital status, 90(69.2%), respondents were married, 20(15.4%), were single 10(7.7%), were divorced and 5(3.8%) were separated or widowed. This demographic profile indicates

a diverse sample, with a significant proportion of individuals in their prime working age and a notable level of marital stability, which may influence their engagement with agricultural extension services and their Food Security.

Agricultural input provision

This section presents responses on the provision of agricultural inputs under the Operation Wealth Creation (OWC) program and how these inputs contribute to rural household food security.

Table 4: Responses on agricultural input provision (n = 130)

Statement	SD (f%)	D (f%)	N (f%)	A (f%)	SA (f%)	Mean	Std. Dev
I have received quality seeds through OWC.	4 (3.1%)	8 (6.2%)	15 (11.5%)	65 (50.0%)	38 (29.2%)	3.96	0.96
The seeds provided by OWC have improved my crop yields.	5 (3.8%)	9 (6.9%)	14 (10.8%)	64 (49.2%)	38 (29.2%)	3.93	1.01
The fertilizers from OWC have enhanced soil fertility on my farm.	6 (4.6%)	10 (7.7%)	17 (13.1%)	61 (46.9%)	36 (27.7%)	3.85	1.05
The fertilizers supplied are suitable for my crop production needs.	7 (5.4%)	11 (8.5%)	19 (14.6%)	58 (44.6%)	35 (26.9%)	3.79	1.09
The livestock received from OWC has improved my household food security.	5 (3.8%)	10 (7.7%)	16 (12.3%)	63 (48.5%)	36 (27.7%)	3.88	1.02
The number and quality of livestock provided by OWC meet my expectations.	8 (6.2%)	12 (9.2%)	18 (13.8%)	58 (44.6%)	34 (26.2%)	3.75	1.12

Table 4 presents responses on agricultural input provision through the Operation Wealth Creation (OWC) program. The data captures beneficiaries' experiences and perceptions regarding the quality and suitability of seeds, fertilizers, and livestock received under the program and their impact on farming outcomes and household food security.

Responses on receiving quality seeds through OWC indicate that the majority of respondents agreed 65 (50.0%) and strongly agreed 38 (29.2%) that they received quality seeds. A smaller proportion remained neutral, 15 (11.5%), while 8 (6.2%) disagreed and 4 (3.1%) strongly disagreed. With a high mean score of 3.96 and a standard deviation of 0.96, the responses show that most farmers positively rated the quality of seeds distributed under OWC.

Responses on whether the seeds provided by OWC have improved crop yields show that 64 (49.2%) agreed and 38 (29.2%) strongly agreed, indicating that the majority experienced increased yields. A total of 14 (10.8%) were neutral, while a small fraction disagreed, 9 (6.9%), and strongly disagreed, 5 (3.8%). The mean score of 3.93 and standard deviation of 1.01 reflect a generally favorable outcome on crop productivity due to the distributed seeds.

Responses on whether the fertilizers from OWC have enhanced soil fertility reveal that 61 (46.9%) agreed and 36 (27.7%) strongly agreed. Meanwhile, 17 (13.1%) were neutral, 10 (7.7%) disagreed, and 6 (4.6%) strongly disagreed. With a mean of 3.85 and a standard deviation of 1.05, the results suggest that most farmers found the fertilizers beneficial to soil health, although a few were uncertain or disagreed.

Responses on the suitability of fertilizers for specific crop production needs indicate that 58 (44.6%) agreed and 35 (26.9%) strongly agreed. However, 19 (14.6%) were neutral, 11 (8.5%) disagreed, and 7 (5.4%) strongly disagreed. The mean response was 3.79 with a standard deviation of 1.09, showing that while most respondents found the fertilizers suitable, a noticeable portion remained indifferent or dissatisfied.

Responses on whether livestock received from OWC improved household food security show that 63 (48.5%) agreed and 36 (27.7%) strongly agreed. Others remained

neutral 16 (12.3%), while 10 (7.7%) disagreed and 5 (3.8%) strongly disagreed. The mean score of 3.88 and standard deviation of 1.02 suggest that livestock support contributed significantly to improving food availability in many households.

Responses on whether the number and quality of livestock met expectations were slightly more mixed, with 58 (44.6%) agreeing and 34 (26.2%) strongly agreeing. However, 18 (13.8%) were neutral, 12 (9.2%) disagreed, and 8 (6.2%) strongly disagreed. The mean response of 3.75 and the standard deviation of 1.12 reflect a generally positive view, but with a higher level of dissatisfaction compared to other inputs.

During interviews, Respondents noted that OWC has distributed a variety of inputs, including maize seeds, bean seeds, cassava cuttings, Irish potato vines, coffee seedlings, fertilizers, pesticides, and livestock (goats, poultry, and pigs). These were supplied based on seasonal plans and the priority needs of farmers.

One parish chief noted:

"We've seen farmers receiving bean seeds, hybrid maize, and sometimes coffee seedlings. These inputs are often enough to start small-scale planting, though they are not always consistent."

However, many respondents expressed concerns regarding the effectiveness and timeliness of input distribution. A Sub-County official observed:

"Sometimes inputs arrive when the planting season is almost over. This affects productivity and causes frustration among farmers."

Challenges mentioned included poor targeting, delayed delivery, and a lack of sensitization on how to use some inputs effectively. One district respondent commented:

"Some farmers don't know how to use the fertilizers properly. There is limited training that goes along with the input distribution."

Despite the challenges, officials acknowledged that inputs have increased production for many households when timely and appropriately distributed.

Rural household food security

Table 5: Responses on Rural Household Food Security (n = 130)

Statement	SD (f%)	D (f%)	N (f%)	A (f%)	SA (f%)	Mean	Std. Dev.
Household crop production increased last season.	3 (2.3%)	8 (6.2%)	16 (12.3%)	68 (52.3%)	35 (26.9%)	3.95	0.91
Livestock numbers and output improved.	4 (3.1%)	9 (6.9%)	18 (13.8%)	63 (48.5%)	36 (27.7%)	3.91	0.97
We have sufficient food stocks for the season.	5 (3.8%)	10 (7.7%)	20 (15.4%)	60 (46.2%)	35 (26.9%)	3.85	1.02
Food prices are affordable in local markets.	6 (4.6%)	12 (9.2%)	25 (19.2%)	53 (40.8%)	34 (26.2%)	3.74	1.11

Distance to food markets is not a barrier.	6 (4.6%)	11 (8.5%)	24 (18.5%)	55 (42.3%)	34 (26.2%)	3.76	1.08
I access credit or savings to buy food when needed.	5 (3.8%)	9 (6.9%)	22 (16.9%)	60 (46.2%)	34 (26.2%)	3.85	1.01
My household eats a variety of food types.	4 (3.1%)	10 (7.7%)	21 (16.2%)	61 (46.9%)	34 (26.2%)	3.85	0.99
We have regular and adequate meals daily.	4 (3.1%)	9 (6.9%)	23 (17.7%)	59 (45.4%)	35 (26.9%)	3.86	1.00
All members maintain good nutritional health.	4 (3.1%)	8 (6.2%)	21 (16.2%)	62 (47.7%)	35 (26.9%)	3.89	0.98

Table 5 presents responses on rural household food security, exploring factors such as household crop production, livestock output, food availability, affordability, market access, and nutritional health.

Responses on whether household crop production increased last season reveal that 68 (52.3%) agreed and 35 (26.9%) strongly agreed, with 16 (12.3%) remaining neutral. A small portion, 8 (6.2%), disagreed, and 3 (2.3%) strongly disagreed. The mean score of 3.95 and standard deviation of 0.91 indicate that a significant number of respondents experienced an increase in crop production, contributing positively to food security.

Responses on whether livestock numbers and output improved show that 63 (48.5%) agreed and 36 (27.7%) strongly agreed, while 18 (13.8%) were neutral. Additionally, 9 (6.9%) disagreed, and 4 (3.1%) strongly disagreed. The mean score of 3.91 and standard deviation of 0.97 suggest positive changes in livestock numbers and output, further supporting household food security.

Responses on whether respondents have sufficient food stocks for the season reveal that 60 (46.2%) agreed and 35 (26.9%) strongly agreed, while 20 (15.4%) were neutral. A smaller portion, 10 (7.7%), disagreed, and 5 (3.8%) strongly disagreed. The mean score of 3.85 and standard deviation of 1.02 reflect a generally favorable response, indicating that many households have enough food stocks to last through the season.

Responses on whether food prices are affordable in local markets show that 53 (40.8%) agreed and 34 (26.2%) strongly agreed, with 25 (19.2%) neutral responses. However, 12 (9.2%) disagreed, and 6 (4.6%) strongly disagreed. The mean score of 3.74 and standard deviation of 1.11 suggest that while food prices are affordable for some, there are challenges with affordability for others.

Responses on whether the distance to food markets is a barrier indicate that 55 (42.3%) agreed and 34 (26.2%) strongly agreed, with 24 (18.5%) remaining neutral. A small number, 11 (8.5%), disagreed, and 6 (4.6%) strongly disagreed. The mean score of 3.76 and standard deviation of 1.08 suggest that distance to food markets is not a significant barrier for most households, but still affects some.

Responses on whether respondents access credit or savings to buy food when needed show that 60 (46.2%) agreed and

34 (26.2%) strongly agreed, with 22 (16.9%) neutral responses. A small proportion, 9 (6.9%), disagreed, and 5 (3.8%) strongly disagreed. The mean score of 3.85 and standard deviation of 1.01 reflect a positive outlook on financial access for food purchasing.

Responses on whether households eat a variety of food types reveal that 61 (46.9%) agreed and 34 (26.2%) strongly agreed, while 21 (16.2%) were neutral. A small number, 10 (7.7%), disagreed, and 4 (3.1%) strongly disagreed. The mean score of 3.85 and standard deviation of 0.99 indicate that most households consume a diverse range of foods, contributing to improved nutrition.

Responses on whether households have regular and adequate meals daily show that 59 (45.4%) agreed and 35 (26.9%) strongly agreed, with 23 (17.7%) neutral responses. A smaller number, 9 (6.9%), disagreed, and 4 (3.1%) strongly disagreed. The mean score of 3.86 and standard deviation of 1.00 suggest that many households experience regular and adequate meals, contributing to food security.

Responses on whether all household members maintain good nutritional health reveal that 62 (47.7%) agreed and 35 (26.9%) strongly agreed, while 21 (16.2%) were neutral. Additionally, 8 (6.2%) disagreed, and 4 (3.1%) strongly disagreed. The mean score of 3.89 and standard deviation of 0.98 indicate that most households report good nutritional health, which is essential for maintaining food security.

During interviews, on the issue of food security, most respondents agreed that OWC has positively impacted food availability, especially where households received both inputs and training. One local official stated:

“OWC has helped many homes to grow enough beans and maize to feed themselves. Some even sell the surplus.”

Households were reportedly eating more frequently and with greater variety, improving nutritional outcomes. However, some groups remain vulnerable. A Sub-County Chief noted:

“Widows, elderly people, and landless households still face food shortages, especially during drought seasons.”

Another respondent added:

“The program has helped, but food security is not yet guaranteed for everyone. Some families are still eating one meal a day.”

To enhance the program’s impact, respondents suggested several strategies, including the introduction of irrigation systems, timely delivery of inputs, expanded training, and

investment in storage facilities. As one district official concluded:

“If OWC could invest more in infrastructure and post-harvest storage, it would help reduce waste and ensure that households remain food secure even during bad seasons.”

Table 6: Correlation between OWC variables and rural household food security

Variable	Provision of Agricultural Inputs	Agricultural Extension Services	Market Access and Linkage Support
Crop Production Levels	Pearson Correlation	.812**	.790**
	Sig. (2-tailed)	.000	.001
	N	130	130
Livestock Numbers and Output	Pearson Correlation	.765**	.752**
	Sig. (2-tailed)	.001	.001
	N	130	130
Household Food Stocks	Pearson Correlation	.742**	.730**
	Sig. (2-tailed)	.002	.002
	N	130	130
Food Price Index	Pearson Correlation	.689**	.675**
	Sig. (2-tailed)	.005	.006
	N	130	130
Distance to Food Markets	Pearson Correlation	.667**	.659**
	Sig. (2-tailed)	.007	.008
	N	130	130
Access to Credit and Savings	Pearson Correlation	.720**	.702**
	Sig. (2-tailed)	.003	.004
	N	130	130
Dietary Diversity	Pearson Correlation	.747**	.735**
	Sig. (2-tailed)	.002	.002
	N	130	130
Meal Frequency	Pearson Correlation	.758**	.740**
	Sig. (2-tailed)	.001	.002
	N	130	130
Nutritional Status	Pearson Correlation	.771**	.751**
	Sig. (2-tailed)	.001	.001
	N	130	130

** Correlation is significant at the 0.05 level (2-tailed).

Table 6 presents the correlation between Operation Wealth Creation variables and various aspects of rural household food security. The results indicate strong, positive relationships, suggesting that these OWC interventions play a significant role in enhancing food security in rural households.

On crop production levels, both the provision of agricultural inputs (Pearson correlation = 0.812, p-value = 0.000) and agricultural extension services (Pearson correlation = 0.790, p-value = 0.001) show strong, positive correlations. These results suggest that the support provided through agricultural inputs and extension services

significantly contributes to improved crop production levels, thus enhancing food security in rural households.

On livestock numbers and output, the provision of agricultural inputs (Pearson correlation = 0.765, p-value = 0.001) and agricultural extension services (Pearson correlation = 0.752, p-value = 0.001) also exhibit significant positive correlations. This indicates that both the provision of inputs and extension services help increase livestock numbers and output, which is essential for improving food security in rural areas.

On household food stocks, there is a significant positive correlation with both the provision of agricultural inputs

(Pearson correlation = 0.742, p-value = 0.002) and agricultural extension services (Pearson correlation = 0.730, p-value = 0.002). This suggests that by enhancing crop production and improving livestock output, these OWC variables help ensure that households maintain sufficient food stocks, improving overall food security.

On the food price index, both the provision of agricultural inputs (Pearson correlation = 0.689, p-value = 0.005) and agricultural extension services (Pearson correlation = 0.675, p-value = 0.006) show positive correlations. These results suggest that better agricultural support through OWC interventions helps stabilize food prices, making food more affordable and accessible for rural households.

On distance to food markets, both the provision of agricultural inputs (Pearson correlation = 0.667, p-value = 0.007) and agricultural extension services (Pearson correlation = 0.659, p-value = 0.008) exhibit positive correlations. These findings suggest that enhanced agricultural productivity and access to OWC support help mitigate barriers posed by distance to food markets, improving market access for rural households.

On access to credit and savings, both the provision of agricultural inputs (Pearson correlation = 0.720, p-value = 0.003) and agricultural extension services (Pearson correlation = 0.702, p-value = 0.004) show significant positive correlations. This suggests that OWC interventions help improve financial resilience, allowing rural households to access credit and savings, which in turn helps them invest in agricultural improvements and food security.

On dietary diversity, the provision of agricultural inputs (Pearson correlation = 0.747, p-value = 0.002) and agricultural extension services (Pearson correlation = 0.735, p-value = 0.002) shows significant positive correlations. This indicates that the support provided through these OWC interventions leads to greater dietary diversity, enhancing the nutritional status of rural households. On meal frequency, there are significant positive correlations with both agricultural inputs (Pearson correlation = 0.758, p-value = 0.001) and agricultural extension services (Pearson correlation = 0.740, p-value = 0.002). These results suggest that households receiving support from OWC are more likely to have regular meals, a key indicator of food security.

On nutritional status, both the provision of agricultural inputs (Pearson correlation = 0.771, p-value = 0.001) and agricultural extension services (Pearson correlation = 0.751, p-value = 0.001) demonstrate strong positive correlations. This indicates that the provision of agricultural inputs and extension services significantly contributes to better nutritional health in rural households. The results reveal that OWC interventions, particularly the provision of agricultural inputs, agricultural extension services, and market access and linkage support, are positively correlated with various aspects of rural household food security. These interventions have a strong influence on improving crop production, livestock output, household food stocks, financial access, dietary diversity, meal frequency, and nutritional status, ultimately fostering greater food security in rural communities.

Table 7: Regression results for operation wealth creation and rural household food security

Dependent Variable	Independent Variable	β Coefficient	Std. Error	t- value	Sig. (p- value)	R- squared	F- value
Crop Production Levels	Provision of Agricultural Inputs	0.215	0.063	3.410	0.001	0.678	24.659
	Agricultural Extension Services	0.184	0.070	2.630	0.009		
	Market Access and Linkage Support	0.210	0.065	3.231	0.002		
Livestock Numbers and Output	Provision of Agricultural Inputs	0.192	0.059	3.253	0.002	0.664	22.874
	Agricultural Extension Services	0.162	0.067	2.423	0.017		
	Market Access and Linkage Support	0.178	0.061	2.919	0.004		
Household Food Stocks	Provision of Agricultural Inputs	0.182	0.065	2.800	0.006	0.639	20.146
	Agricultural Extension Services	0.143	0.070	2.043	0.043		
	Market Access and Linkage Support	0.158	0.063	2.504	0.013		
Food Price Index	Provision of Agricultural Inputs	0.152	0.070	2.171	0.031	0.586	15.429

	Agricultural Extension Services	0.110	0.078	1.413	0.159		
	Market Access and Linkage Support	0.148	0.073	2.026	0.044		
Distance to Food Markets	Provision of Agricultural Inputs	0.170	0.071	2.395	0.019	0.602	17.926
	Agricultural Extension Services	0.122	0.079	1.544	0.124		
	Market Access and Linkage Support	0.162	0.072	2.250	0.026		
Access to Credit and Savings	Provision of Agricultural Inputs	0.160	0.064	2.500	0.013	0.629	18.384
	Agricultural Extension Services	0.135	0.071	1.897	0.061		
	Market Access and Linkage Support	0.175	0.068	2.576	0.011		
Dietary Diversity	Provision of Agricultural Inputs	0.191	0.062	3.081	0.003	0.650	21.489
	Agricultural Extension Services	0.146	0.067	2.173	0.031		
	Market Access and Linkage Support	0.164	0.060	2.733	0.007		
Meal Frequency	Provision of Agricultural Inputs	0.198	0.060	3.300	0.001	0.669	23.087
	Agricultural Extension Services	0.162	0.069	2.348	0.020		
	Market Access and Linkage Support	0.172	0.062	2.774	0.006		
Nutritional Status	Provision of Agricultural Inputs	0.175	0.063	2.779	0.006	0.621	19.478
	Agricultural Extension Services	0.130	0.071	1.831	0.069		
	Market Access and Linkage Support	0.163	0.065	2.508	0.013		

The regression analysis reveals that all OWC variables significantly impact crop production levels. Provision of Agricultural Inputs ($\beta = 0.215$, $p\text{-value} = 0.001$) has a positive and significant effect, indicating that increased input provision leads to higher crop production levels. The R-squared value of 0.678 suggests that about 67.8% of the variance in crop production levels is explained by the OWC variables, with the F-value of 24.659 indicating that the model is statistically significant.

In terms of livestock numbers and output, the OWC variables show significant positive relationships. Provision of Agricultural Inputs ($\beta = 0.192$, $p\text{-value} = 0.002$) has a positive and significant effect on livestock numbers and output. The model's R-squared value of 0.664 indicates that approximately 66.4% of the variance in livestock numbers and output is explained by the independent variables, and the F-value of 22.874 shows the model's significance.

For household food stocks, provision of Agricultural Inputs ($\beta = 0.182$, $p\text{-value} = 0.006$) significantly increases food stocks. The R-squared value of 0.639 indicates that about 63.9% of the variance in food stocks is explained by the independent variables, and the F-value of 20.146 highlights the model's statistical significance.

In the case of the food price index, the results show that Provision of Agricultural Inputs ($\beta = 0.152$, $p\text{-value} = 0.031$) significantly affects food prices, with a positive relationship suggesting that agricultural input provision helps stabilize food prices. The R-squared value of 0.586 indicates that 58.6% of the variance in the food price index is explained by the independent variables, and the F-value of 15.429 confirms the model's significance.

The results indicate that the Provision of Agricultural Inputs ($\beta = 0.170$, $p\text{-value} = 0.019$) significantly reduces the distance to food markets, improving access to food. For access to credit and savings, all OWC variables show positive correlations. Provision of Agricultural Inputs ($\beta =$

0.160, p -value = 0.013) is a significant contributor to improved financial access. The model explains 62.9% of the variance in access to credit and savings, as indicated by the R-squared value of 0.629, and the F-value of 18.384 demonstrates the model's statistical significance.

On dietary diversity, the variable positively impacts the diversity of diets. Provision of Agricultural Inputs (β = 0.191, p -value = 0.003) is statistically significant. The R-squared value of 0.650 indicates that 65.0% of the variation in dietary diversity is explained by the independent variables, with a highly significant F-value of 21.489.

For meal frequency, the results are similarly positive. Provision of Agricultural Inputs (β = 0.198, p -value = 0.001) has a significant positive effect. The R-squared value of 0.669 suggests that the model explains 66.9% of the variance in meal frequency, with an F-value of 23.087, confirming the model's significance.

For nutritional status, the Provision of Agricultural Inputs (β = 0.175, p -value = 0.006) positively influences nutritional status. The R-squared value of 0.621 indicates that the model explains 62.1% of the variation in nutritional status, with an F-value of 19.478, which further validates the significance of the model. The regression results highlight that the OWC variables provision of agricultural inputs, agricultural extension services, and market access and linkage support have a significant positive effect on various aspects of rural household food security. The high R-squared values for most models suggest that these variables explain a substantial portion of the variation in food security indicators such as crop production, livestock output, food stocks, and dietary diversity.

Discussion

Provision of agricultural inputs and food security

The study revealed that agricultural inputs distributed under the OWC program, such as maize seeds, bean seeds, cassava cuttings, Irish potato vines, coffee seedlings, fertilizers, and livestock, improved food availability and crop yields for households that received them. However, challenges such as delayed delivery, insufficient quantities, and poor targeting limited the program's effectiveness. Similar to the findings of Pender et al. (2019), who found that agricultural programs can lead to increased food security when properly implemented, the OWC inputs improved crop yields and food availability. However, discuss that logistical issues like delayed delivery and insufficient quantities are significant barriers to the success of agricultural development programs. Deininger also highlights that poorly targeted interventions fail to address the needs of the most vulnerable farmers, limiting the

program's effectiveness, which is consistent with the challenges identified in this study (Deininger, 2017).

The study found that the majority of respondents received good-quality seeds, which contributed positively to their farming activities and were generally appropriate for the crops they were growing. The findings align with Munyua (2018), who noted that the provision of good-quality seeds plays a significant role in increasing agricultural productivity. Koo and Nishida (2019) argue that high-quality seed provision is essential for improving yields, which is reflected in the positive outcomes noted by farmers in this study. Moreover, Schneider et al. (2020) found that seed quality directly impacts crop yields.

The seeds provided by OWC were reported to have improved crop yields. Farmers linked the improved productivity to the high-quality seeds received under the program. The study revealed that fertilizers distributed under OWC improved soil fertility, with many farmers reporting increased crop health and productivity. However, some farmers were unsure or reported no significant difference, indicating the need for better guidance on fertilizer use. The findings align with Ogisi et al. (2023), who found that fertilizers are essential in boosting soil fertility and crop yields, especially in resource-constrained farming environments. Krasilnikov et al. (2022) further corroborated these results, stressing that while fertilizers have a positive impact on soil health, their effectiveness is often dependent on the correct application techniques. Many farmers found the fertilizers suitable for their crop production needs, though some were neutral or expressed concerns about mismatched fertilizer types, suggesting a gap in needs assessment before input distribution. The importance of matching fertilizers with specific crop requirements is emphasized by Oyakhilomen Oyibo, who highlighted that fertilizers need to be tailored to the specific soil and crop needs for maximum impact (Oyakhilomen Oyibo, 2019). Morris et al. (2021) also argue that incorrect or mismatched fertilizer types often lead to suboptimal crop yields, which reflects the concerns of some farmers in this study. Livestock provided through OWC improved household food security by offering access to animal protein, milk, and additional income. However, there were mixed reactions regarding the quality and quantity of livestock received. This finding is consistent with Cornelsen, who noted that livestock support is essential for improving household nutrition and diversifying income sources (Cornelsen et al., 2016).

Conclusion

The study concluded that the provision of agricultural inputs under Operation Wealth Creation (OWC) has significantly improved food production in Rugarama Sub-County, though its impact is constrained by irregular supply, poor targeting, and inadequate sensitization. While

OWC has contributed to increased food availability and accessibility, certain groups remain food insecure due to socio-economic disparities, including poverty, limited access to land, and unequal resource distribution, as well as environmental vulnerabilities like unpredictable weather and soil degradation. Overall, while OWC has made positive strides in enhancing food security, challenges such as inconsistent input supply, limited extension services, and socio-economic and environmental factors need to be addressed to fully realize its potential and ensure sustainable food security for all households.

Recommendations

OWC should improve logistics and coordination to ensure the timely delivery of adequate and high-quality agricultural inputs to all eligible households. Special support mechanisms should be developed for landless, elderly, and female-headed households to ensure inclusivity in food security programs. OWC should incorporate water harvesting, irrigation, and climate-smart practices to mitigate the effects of seasonal droughts and ensure year-round food production. Strengthening farmer groups and linking them with agro-processing firms and traders can enhance market access, value addition, and household resilience.

Acknowledgement

I extend my unlimited appreciation to my Dear Mother, Mrs. Masanyu Christine Bukyeka, and My Dear Father, Late Mzee Teodoro Bukyeka, for the love, care, and support they have given me; without them, it would have been hard to pass through this academic struggle. Further appreciation goes to my Dear wife, Kyomugabe Glorius, my sisters Ahumuza Vastine and Kentalata Caroline, my brothers Andinda Chrisent, Gumisiriza Onesmus, and Anyorekyire Josephat for the moral and financial support they have extended throughout my study. May God reward them abundantly. I also appreciate all my friends and coursemates, especially Ellison, Sharon, Edson, and Florence, for their encouragement, social support, and teamwork work which enabled me to reach this far.

List of abbreviations

CVI -	Content Validity Index
OWC -	Operation Wealth Creation
SPSS -	Statistical Package for the Social Sciences
ToM -	Theory of Modernization
BSU -	Bishop Stuart University
FY -	Fiscal Year
ICT -	Information and Communication Technology

MAAI -	Ministry of Agriculture, Animal Industry and Fisheries
MAAIF -	Ministry of Agriculture, Animal Industry and Fisheries
NAADS -	National Agricultural Advisory Services
PEAP -	Poverty Eradication Action Plan
PMA -	Plan for Modernization of Agriculture
REC -	Research Ethics Committee
UBOS -	Uganda Bureau of Statistics
UPDF -	Uganda People's Defence Force

Source of funding

The study did not receive any funding or a grant.

Conflict of interest

The author declares no conflict of interest.

Author contributions

Mathius Mujurizi was the principal investigator. Professor Roberts K Muriisa and Dr. Milton Rwangire supervised the research project.

Data availability

Data is available upon request.

Author biography

Mathius Mujurizi holds a Master's in Public Administration and Management from Bishop Stuart University.

Professor Roberts K Muriisa is a lecturer at Bishop Stuart University and Mbarara University of Science and Technology

Dr. Milton Rwangire is a lecturer at Bishop Stuart University.

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