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Influence of Information and Communication Technologies on The Performance of Agricultural Projects in Rwanda: The Case Study of Imbaraga Farmers' Voice Project

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Abstract: **The main objective of this study is to assess the influence of Information and communication technologies (ICT) on the performance of Agricultural projects in Rwanda, specifically in Imbaraga Farmers Voice Project (IFVP). This study was guided by the following specific objectives: to determine the contribution of ICT on timeliness in IFVP, to assess the effect of ICT on cost performance in IFVP, and to analyze the influence of types of information and services on agricultural productivity in IFVP. This Study is supported by the Management Theory of project Management, the Diffusion of Innovation Theory, and the Technology Acceptance Model. This research is descriptive research design, and the study population comprised 135 stakeholders of IFVP/Burera Antenna. Using simple random sampling technique, a sample size of 101 respondents was established through calculations carried out using Slovin formula. The researcher used primary data in this study. A closed end questionnaire was utilized. Correlation analysis was utilized to assess the relationship between the variables, while multiple regression was used to test hypotheses. To compute and analyze the data in this study, available statistical product for service solution (SPSS 27) was used. The results of correlation analysis showed that there is a positive and significant relationship between ICT and Timeliness is strong positive and significant (r=0.975 and sig=0.000<0.01) level of significance, between ICT and Cost performance is strong positive and significant (r=0.950 and sig=0.000<0.01) level of significance, between ICT and Agricultural productivity is strong positive and significant (r= 0.993 and sig=0.00<0.01) level of significance. Model 1 showed that predictors of ICT (ICT Tools, System quality, and Types of information and services) jointly accounted for 96.5% of the timeliness in IFVP. Model 2 showed that predictors of ICT (ICT Tools, System quality, and Types of information and services) jointly accounted for 95.1% of the cost performance in IFVP. Model 3 indicate that the predictors of ICT (ICT Tools, System quality, and Types of information and services) jointly accounted for 99.3% of the Agricultural productivity in IFVP. On the basis of findings from the ANOVA, the study concluded that there were significant and positive effects between ICT and project performance of IFVP, and all null hypotheses were rejected at 5% level of significance. Some weaknesses were found and the study recommends investing in network infrastructure, partnering with telecommunications companies, and deploying advanced technologies for rural areas. It also suggests creating digital platforms for agricultural financing, developing mobile banking applications, and promoting ICT-based solutions for farmers.**

Keywords: **Information and Communication Technologies, Agricultural Projects, Imbaraga Farmers' Voice Project, Rwanda.**

1. INTRODUCTION

Agriculture serves as the backbone of economies worldwide, providing sustenance, employment, and economic stability to millions of individuals. However, despite its critical role, the performance of agriculture in many regions often falls short of its potential, leading to various socio-economic challenges (Okello, Feleke, Gathungu, Owuor & Ayuya, 2020). The

repercussions of underperforming agriculture are multifaceted, affecting food security, livelihoods, environmental sustainability, and overall economic development (Sennuga, 2020).

The agriculture sector remains a significant sector worldwide. It is the main source of income for the majority of rural population around the globe. The agriculture sector accounts for almost two-thirds of the total employment and about 75% of domestic trade (Ayim, Kassahun, Addison2 & Tekinerdogan, 2022). With most of the rural population depending on agriculture for their livelihoods, the growth and development of the sector are critical. Moreover, there is another problem obsessing many agriculture projects, which is how to formulate and implement strategies which may allow them to perform well (Hooks, Davis, Agrawal & Li, 2021). The growth and development of the agriculture sector can be achieved through the effective deployment of Information Communication Technology (ICT). ICT has been a significant contributor to the growth and socio-economic development in countries, where ICT is deployed effectively (Sennuga, 2020).

In China, Kang, Sidhoum, Frick, Sauer and Zhen (2022) state that since the 1990 and the adoption of ICT by Chinese farmers, agriculture performance has been considerably impacted farm performance. In Malaysia, Chhachhar, Qureshi, Khushk and Ahmed (2020) stated that farmers are using information and communication technologies for growth of the agriculture. However, due to lack of knowledge and information about these technologies farmers are not getting benefit from these technologies in their working places.

In Zambia, Nkandu and Phiri (2022) highlighted that the application of ICTs to the agricultural sector, which is mostly considered as the largest economic sector in the country, has resulted into increase in productivity usage of new high yield variety seeds, chemical fertilizers and other inputs. In Nigeria, Ayotunde and Oyedeji (2022) stated that ICT kiosks, ICT-equipped intermediary organizations and mobile phones play an important role in strengthening the more complex and time-urgent pathways of information and knowledge-sharing on which agricultural innovations depend.

In Tanzania, Okello, Feleke, Gathungu, Owuor and Ayuya (2020) stipulated that ICT would enable extension workers to gather, store, retrieve and disseminate a broad range of information needed by small producers such as information on best practices, new technology, better prices of input and outputs, better storage facilities, improved transportation links, collective negotiations with buyers, information on weather. In Uganda, Mwantimwa (2021) argues that the integration of ICT in agricultural production facilitates access to technical and market information that contributes to efficiency improvement and productivity gain along all agricultural value chains.

In Rwanda, Kabirigi, Sekabira, Sun and Hermans (2021) found that that the use of mobile phone-based ICT platforms is a potential way to reorganize and facilitate formal agricultural extension by delivering relevant, timely, and cost-effective information, and improve communication among farmers in the context of informal knowledge sharing networks. While Kamande and Nafula (2021) stated that ICTs can particularly improve communication and information access among actors along agri-food supply chains and other stakeholders, thus making development inclusive even for those who are located remotely.

Rwanda is primarily an agrarian economy that is in transition to a middle-income country by 2020. The transformation of agriculture into a productive, high value, market oriented sector, with forward linkages to other sectors is thus one of the pillars of the National Strategy for transformation (NST 1, 2018). This transformation is also anchored in the belief that actively applying Information and Communication Technologies is critical to the transition of the economy to an information-rich and knowledge-based economy).

Therefore, this study aims at assessing the contribution of information and communication technology and the performance of agriculture projects in Rwanda, by taking the Imbaraga Farmers Voice Project (IFVP) as case study.

Created in 1992, IMBARAGA is a National Farmer Organization from Rwanda that works to improve the socio-economic conditions of an estimated 27,300 farmers located in 25 out of 30 districts across the country. IMBARAGA is now a local NGO which was initially created as a trade union organization. In 2013, with changes in the law regulating the functioning of local NGOs, which does no longer recognize trade unions, Imbaraga shifted from a trade union to become a local NGO with the same mandate, vision and mission of protecting farmers' interests. It was created at the initiative of farmers in Rwanda because these latter were voiceless and facing so many challenges in their businesses. For this reason, in order to solve their own problems, farmers have joined their efforts as far as lobby and advocacy issues are concerned. Thus, Imbaraga was created in this context of fighting for the farmers' cause (Imbaraga Organization, 2023). The main objective of this study was to assess the influence of ICT on the performance of Agricultural projects in Rwanda, specifically in Imbaraga Farmers Voice Project (IFVP). It was guided by the following specific objectives:

i. To determine the contribution of ICT on the timeliness in Imbaraga Farmers Voice Project.

ii. To assess the effect of ICT on cost performance in Imbaraga Farmers Voice Project.

iii. To analyze the influence of ICT on agricultural productivity in Imbaraga Farmers Voice Project.

2. THEORETICAL FRAMEWORK

Management Theory of project Management

The formalization of project management as a structured theory emerged with Henry Gantt's work in the early 20th century (specifically, the Gantt chart introduced in 1917), but it was further developed into comprehensive models by scholars like Frederick Winslow Taylor (Scientific Management, late 19th and early 20th century) and later by the Project Management Institute (PMI) in the 1960s (Hooks, *et al.*, 2021). The Management Theory of Project Management focuses on structured processes for planning, executing, and monitoring projects. It is built on key principles such as scope, time, cost, and quality management. The theory advocates that successful project management requires adhering to these constraints while managing human resources, risks, and communication. Essentially, it offers a framework for effectively delivering projects within predefined parameters (Pratt, 2022).

Supporters of this theory argue that structured project management frameworks help ensure efficiency and mitigate risks. PMI and similar organizations formalized these principles in global standards, such as PMBOK (Project Management Body of Knowledge) (Dagne & Oguamanam, 2021).. However, critics argue that rigid adherence to these structures can sometimes stifle creativity and adaptability, particularly in fast-changing industries. Agile management methodologies have risen as a response to these critiques, emphasizing flexibility over strict process management (Pratt, 2022).

The Management Theory of Project Management supports this study on the influence of ICT on agricultural projects by providing a framework for evaluating the performance of these projects. In the context of Rwanda's agricultural sector, ICT tools (such as data management systems, communication platforms, and monitoring tools) enhance the management of project constraints (e.g., time, cost, and quality). Effective ICT adoption aligns with the theory's emphasis on structured processes and resource management, helping to streamline agricultural project execution and performance.

Diffusion of Innovation Theory (DIT)

The Diffusion of Innovation Theory (DIT) was developed by Everett Rogers in 1962. This theory explains how, why, and at what rate innovations (new ideas, practices, or technologies) spread within a community or organization. Rogers categorized adopters into five groups: innovators, early adopters, early majority, late majority, and laggards. The theory suggests that certain social and psychological factors, such as perceived usefulness and social influence, impact how quickly a technology or practice is adopted (Chibsa, 2020).

Supporters of DIT argue that it provides a useful framework for understanding technology adoption and innovation spread, especially in sectors like agriculture where technology uptake is crucial for productivity (Sennuga, 2020). DIT has been widely applied in sectors ranging from healthcare to agriculture to explain how innovations take root (Chibsa, 2020). However, critics note that DIT overly emphasizes individual choice while underplaying structural and systemic factors, such as economic barriers or policy limitations, that may hinder adoption. Some also argue that it is overly linear, assuming that all innovations will eventually be adopted (Dagne & Oguamanam, 2021).

DIT is crucial to this study, as it helps explain the adoption of ICT in agricultural projects in Rwanda. It provides insights into the different categories of adopters within the Rwandan agricultural sector and how innovation diffuses through rural communities. Understanding the diffusion process allows project managers to tailor ICT solutions to different adopter categories, enhancing project performance. For instance, ICT tools like mobile-based farm advisory services may be more quickly adopted by innovators and early adopters, and strategies can be devised to encourage the late majority and laggards to follow suit.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Fred Davis in 1986. TAM explains how users come to accept and use a technology. The model proposes that perceived usefulness (PU) and perceived ease of use (PEOU) are the two main factors influencing users' decisions about whether to adopt a technology. PU refers to the degree to which a person believes that using a system will enhance their job performance, while PEOU refers to how easy the technology is to use. The easier and more useful the technology is perceived to be, the more likely it will be adopted (Sennuga, 2020).

TAM has been widely supported because it offers a simple, effective model for predicting technology adoption in various contexts, including business, healthcare, and agriculture. Many researchers have expanded on TAM, integrating other variables like social influence and facilitating conditions (Pratt, 2022). However, critics argue that TAM focuses too narrowly on PU and PEOU, neglecting other critical factors such as cultural, organizational, or environmental influences (Sennuga, 2020). Mdoda (2022) also points out that it doesn't account for post-adoption behavior and long-term sustainability of technology use.

TAM is highly relevant to this study as it provides a framework for understanding how Rwandan agricultural stakeholders (farmers, project managers, etc.) decide to adopt ICT tools in agricultural projects. In the Rwandan context, where the use of ICT in agriculture is still growing, understanding perceptions of usefulness (e.g., improving crop yields, increasing efficiency) and ease of use (e.g., user-friendly platforms) helps assess how ICT adoption impacts agricultural project performance. By identifying barriers to adoption through TAM, strategies can be developed to improve ICT integration, thereby enhancing project outcomes.

3. CONCEPTUAL FRAMEWORK

The conceptual framework interlinks independent variables and dependent Variable and intervening variables. A conceptual framework is a model that presents and explains the relationship between various variables (Creswell & Creswell, 2018). Figure 2.1 presents the variables of concern in the present study along with their corresponding dimensions, where the independent variable aims of the assessment of ICT, while dependent variable is about the analysis of the performance of agricultural projects.

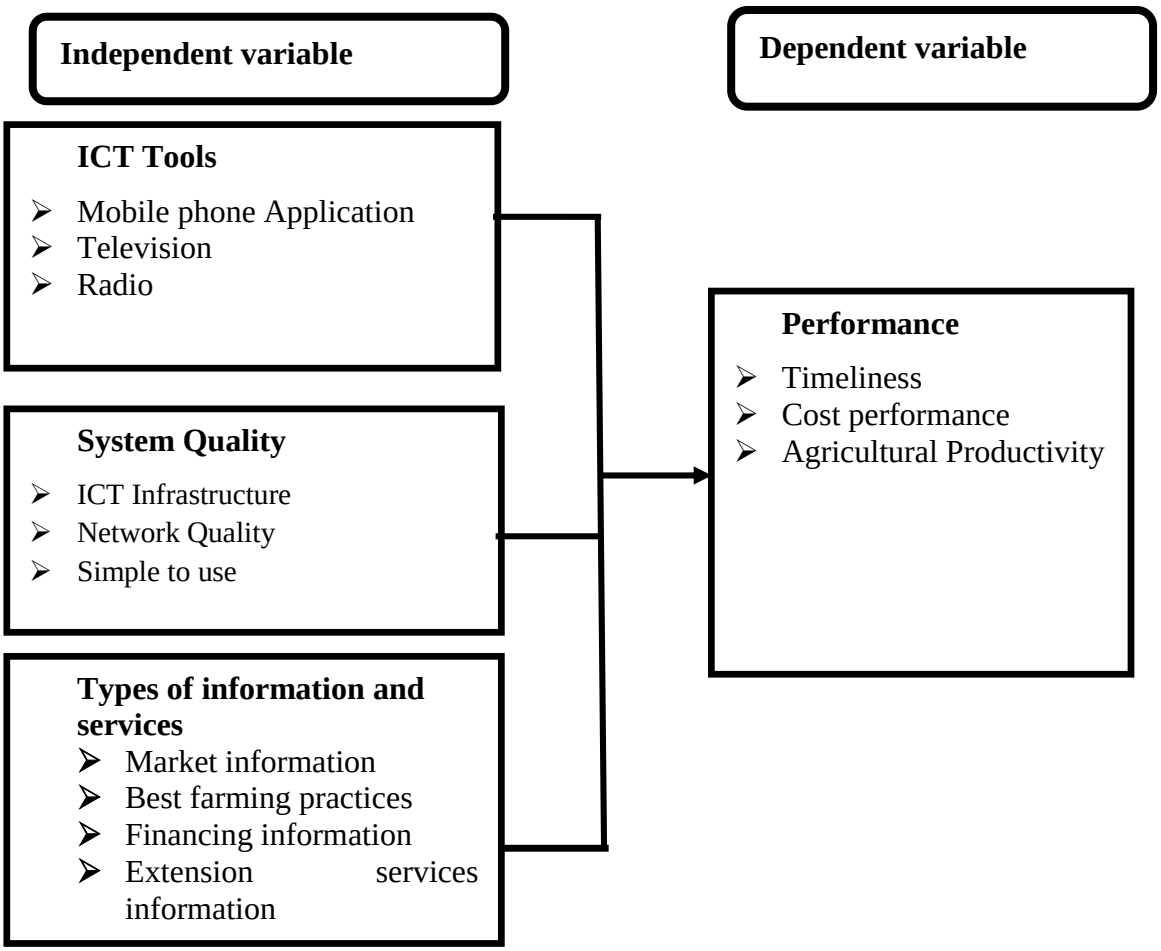

Figure1: Conceptual Framework

Source: Researcher (2024)

In the conceptual framework for this study, the interplay between variables is crucial in understanding how Information and Communication Technologies (ICT) influence the performance of agricultural projects in Rwanda. The independent

variable is ICT, which encompasses tools like mobile phones, internet, radio, and television, all serving as mechanisms for communication, knowledge sharing, and decision-making support. These tools facilitate real-time access to agricultural information, market prices, and weather updates, which can empower farmers and project managers to make more informed and timely decisions. By enhancing communication and information flow, ICT tools create a foundation for better project planning, resource allocation, and overall project execution, which directly impacts agricultural project performance.

The dependent variable is the performance of agricultural projects, which is measured through several indicators such as productivity, efficiency, profitability, and sustainability. ICT tools, when effectively utilized, enhance these performance indicators by providing better access to market and technical information, reducing communication barriers, and improving logistical coordination. For instance, mobile phones and internet services allow farmers and project stakeholders to interact with buyers, access real-time market data, and make decisions that can increase yields and profitability. Additionally, ICT tools enable better project monitoring and evaluation, which is critical for improving resource efficiency and achieving sustainability in agricultural practices. Thus, the interaction between ICT and performance is one of empowerment, where the availability of relevant information leads to better decision-making and ultimately improves project outcomes.

Furthermore, the relationship between the independent and dependent variables is mediated by various contextual factors, such as access to infrastructure, education levels, and socio-economic conditions. For example, the extent to which ICT tools can positively impact agricultural project performance may depend on the availability of supporting infrastructure, such as reliable internet access or electricity, as well as the digital literacy of farmers and project managers. Additionally, external factors like government policies, financial support, and the level of ICT adoption in rural areas can either facilitate or hinder the effectiveness of ICT in enhancing project performance. Understanding these moderating variables is essential for determining the conditions under which ICT can have the most significant positive effect on agricultural projects in Rwanda.

4. RESEARCH METHODOLOGY

Yin (2014) emphasized that research design was a logical process, not merely a logistical one. Just as an architect must first determine the type of building, its intended use, and the needs of its occupants before developing a work plan, so too must a researcher establish a clear research design to guide the study. This study adopted a descriptive research design, specifically a cross-sectional approach, which was appropriate for generating an accurate profile of the factors, events, and situations within the study population at a specific point in time.

The cross-sectional design was particularly suitable for this study as it allowed the researcher to examine the connection between ICT (as the independent variable) and the performance of agricultural projects (as the dependent variable) within the IFVP case study. This approach was chosen because it efficiently captured data on these variables simultaneously, enabling the researcher to draw insights about their relationship at a given point in time.

To evaluate the relationship between the study's variables, correlation analysis was utilized. This statistical method was appropriate for measuring the strength and direction of the relationship between ICT and project performance. Additionally, multiple regression analysis was employed to test the study's hypotheses, providing a robust means to determine the influence of ICT on agricultural project performance while controlling for other factors. This combination of methods ensured a comprehensive analysis, aligning with the study's objectives and contributing to the broader understanding of ICT's impact in the agricultural sector.

Population of the Study

Kothlar and Garg (2014) referred to population of the study as the collection of individuals or objects that are the main focus of scientific queries.

Imbaraga farmers' voice project (IFVP is a project of Imbaraga organization, which is structured from the village level (Farmer Group). At the second level, there is a Basic Section which gathers from 5 to 10 Farmer Groups. The Basic Sections within an administrative district make what Imbaraga calls an "Antenna" while all antennas in a province make a "Region". There are four (4) Regions which make Imbaraga at the national level. Due to the large structure of the stakeholders, the researcher decided to limit her study on the Burera Antenna, which operates in Burera District. Considering the population as the totality of persons or objects with which a study is concerned, the population that was consulted in this study was 135 stakeholders of IFVP/Burera Antenna.

Sample Design

Sample Size

Sample size can be defined as group of representatives selected from the entire population in order of being tested (Saunders *et al*, 2014). Richey and Klein (2014) state that sampling is small number of respondents' selection to represent the population, thus considered as representing the whole and large number of the population that is being studied. Determining the sample sizes involve resource and statistical issues. The population of the present study is as large as data from the IFVP's Management reveals that 135 stakeholders constitute the Burera Antenna, operating in Burera District. As the population is large, therefore a sample was selected for this study using the Slovin formula, as shown below:

The sample size for this study was decided using Slovin's formula: $$n = \frac{N}{1 + N(e)^2}$$

Where n represents the sample size,

N the total size of the population, and e the margin of error (5%).

In this study, N=135.

Calculating the required sample size for the study using the 5% margin of error, the sample size is 101.

$$n = \frac{135}{1+135(0.05)^2} = \frac{135}{1+0.3375} = \frac{135}{1.3375} = 109 \approx 109$$

The sample size of the study is 109 stakeholders of IFVP/Burera Antenna, obtain from the whole population

Sampling Technique

Sampling is the aspect of statistical practice that deals with the selection of single items intended to provide information about the population under consideration, particularly for the goal of drawing statistical conclusions (Saunder, Lewis & Thornhill, 2012). In this study, a representative sample was chosen via simple random sampling. In this method, any member of the study population may got the chance to be sampled for the study (Roundy, 2015). The sample participants in the study share the fact that they operate within IFVP/Burera Antenna.

Data Collection Methods

For this study researcher used both primary and secondary data to reach the objectives of this study. Therefore, to attain this a set of techniques such as questionnaire, and documentary was used.

Data Collection Instrument

The study employed questionnaires and undertake desk research on available documentation for data collection. Desk research was based on the material published in reports and similar documents that are available in public libraries, websites, data obtained from surveys already carried out within IFVP.

Questionnaire

The researcher distributed self- structured questionnaires to respondents selected for the study. The questionnaire design used the Likert scale having five anchors—strongly disagrees, disagree, neutral, agree, and strongly agree—to capture respondents' perceptions about ICT and performance within the case study. It was administered to respondents sampled for the study over a period of two weeks.

Documentation

Saunders *et al.*, (2012) define documents as items that provide details about a topic that academics are interested in studying. The researcher will take care to compare the information from the questionnaire with information from other sources, such as reports which were made public. The researcher will obtain additional information on performance by consulting available documentation on the subject. As a form of knowledge management and knowledge organization, documentation can be provided on paper, online, or on digital or analog media, such as audio tape or CDs (Lohrey, 2014), and the researcher intends to use paper documentation and online documentation only.

5. RESEARCH FINDINGS AND DISCUSSION

Demographic Characteristics of Respondents

The profile of respondents was deemed necessary because the ability of the respondents to give satisfactory information on the study variables greatly depends on their background.

Table 2: Demographic Characteristics of Respondents

Factors	Categories	Frequency	Percentage (%)
Respondents' Gender	Male	57	56
	Female	44	44
	Total	**101**	**100**
Age Group	Below 25	9	9
	Between 26-35 years	32	32
	Between 36-45 years	36	36
	Above 45 years	24	24
	Total	**101**	**100**
Education level	Primary school	29	29
	Secondary Diploma/TVET	50	50
	Bachelor's degree	18	18
	Masters	4	4
	PHD	0	-
	Total	**101**	**100**
Membership Experience	Less 2 years	11	11
	between 2-5 years	20	20
	Between 5-10 years	47	47
	Over 10 years	23	23
	Total	**101**	**53**

Source: Primary Data (2024)

As table 2 shows, during this research, the respondents were both gender, male and female, within IFVP whereas 56% were male while 44% were female. This shows that majority of respondents were male.

Table 2 shows that majority 36% of respondents are between the ages of 36-45 years, followed by those aged between 26-35 years counting 32% of the sample size. Then those aged above 45 years encountered 24%, and the least 9% belongs to people aged below 25 years. This implies that IFVP has stakeholders from all segment of the population and mature people being majority.

From the findings was established that the majority 50% of respondents had secondary school diploma. Followed by people who attained primary school only per 29%, then those with bachelor degree counting 18%, then those with master degree meeting 4%. This is an indication that educated people do not participate mostly in agricultural activities in Rwanda.

From the findings the study established that majority,47%, of respondents had been working in IFVP for a period between 5-10 years, then 23% reported to being members in the project for a period over 10 years, then 20% being within IFVP for a period between 2-5 years, and the remaining 11% provided to be working in IFVP for less than 2 years. The findings imply that the respondents had been working long enough in IFVP and hence had knowledge about the issues that the researcher was looking for.

Descriptive Results

The following part presents the findings of the study based on the specific research objectives. The section describes the data using, frequency, percent, mean and standard deviation. High mean indicated that majority of the responded strongly approved the statements presented to them while standard deviation indicated the degree of dispersion from the mean. The mean value is categorized into very high (4.20- 5.00), high (3.40-4.19), moderate (2.60-3.39), low (1.80-2.59), and very

low (1.00-1.79). The standard deviation below 0.5 was interpreted as indicating homogeneity of answers (which means closeness of answers). The standard deviation above 0.5 indicates heterogeneity.

View on ICT Tools in IFVP

The study sought to examine the effect of ICT Tools in IFVP. The responses from the respondents were logged on a five-point Likert scale anchored by Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5). The respondents were questioned if they agreed or disagreed with the statements and findings are presented in the table 3.

Table 3: View on ICT Tools in IFVP

Statement on ICT Tools	SD		D		UN		A		SA		M	SD
N=101	Fr	%	Fr	%	Fr	%	Fr	%	Fr	%		
Farmers in IFVP use advanced mobile phones in their daily activities	3	3	5	5	8	8	37	37	48	48	4.20	0.49
Mobile phones allow us to get extension services.	5	5	6	6	5	5	38	38	47	47	4.15	0.54
In IFVP we are able to get access on agricultural programs broadcasted by television.	12	12	8	8	8	8	34	34	39	39	3.79	0.68
Television has provided us with innovative agricultural methods and technologies	11	13	17	20	14	35	36	41	23	23	3.40	0.65
In IFVP we are able to get access on agricultural programs broadcasted on Radio	6	6	7	7	10	10	37	37	41	41	4.02	0.56
We are able to get advice on various agricultural issues through interactives radio shows	4	4	13	13	10	10	27	27	47	47	3.95	0.6
Overall Mean											**3.92**	

Source: Primary Data (2024)

The results from table 3 indicated a mean of 4.20 and standard deviation (SD) of 0.49, with most respondents (48%) strongly agreed that farmers in IFVP use advanced mobile phones in their daily activities. The mean of 4.15 and SD of 0.42 with 47% of respondents strongly agreed that Mobile phones allows us to get extension services. The mean of 3.79 and SD of 0.68 with 39% of the respondents strongly agreed that in IFVP they are able to get access on agricultural programs broadcasted by television.

Findings in Table 3 also revealed the mean of 3.40 and SD of 0.66 with most respondents 41% agreed that Television has provided them with innovative agricultural methods and technologies. The mean of 4.02 and SD of 0.56 with 41% of respondents strongly agreed that in IFVP they are able to get access on agricultural programs broadcasted on Radio. Finally, a mean of 3.95 and SD of 0.60 with 47% of respondents strongly agreed that We are able to get advice on various agricultural issues through interactives radio shows.

The overall mean of 3.92 tends which implies that the ICT tools utilized by farmers in IFVP are effectives at a great extent.

Views on System quality in IFVP

The study sought to assess perception of respondents on the System quality in IFVP, the respondents were questioned if they agreed or disagreed with the statements with regard to System quality. The findings were presented in the table 4.

Table 4: System quality in IFVP

Statement on System Quality	SD		D		UN		A		SA		M	SD
N=101	Fr	%	Fr	%	Fr	%	Fr	%	Fr	%		
The hardware used in IFVP are always reliable and durable	8	8	10	10	8	8	37	37	38	38	3.86	0.62
The devices used in IFVP ensures seamless integration and data exchange between different devices.	6	6	7	7	15	15	28	28	45	45	3.98	0.6
IFVP provides always training to its members on the utilization of different ICT systems	12	12	15	15	10	10	38	38	26	26	3.50	0.67
Our Network is secured enough to protect sensitive agricultural data from hackers.	5	5	3	3	13	13	36	36	44	44	4.10	0.53
The ICT system used in IFVP is simply to use for me.	5	5	7	7	11	11	36	36	42	42	4.02	0.56
In IFVP we have access to High-quality network infrastructure which ensure data transmission without disruptions	24	24	21	21	17	17	25	25	14	14	2.84	0.7
Overall Mean											**3.72**	

Source: Primary Data (2024)

Considering system quality in IFVP, the results from table 4 show that the mean of 3.86 and SD of 0.62 with 38% of respondents strongly agreed that the hardware used in IFVP are always reliable and durable. The mean of 3.98 and SD of 0.60 with 45% of respondents strongly agreed that the devices used in IFVP ensures seamless integration and data exchange between different devices. The mean of 3.50 and SD of 0.67 with 38% of respondents agreed that IFVP provides always training to its members on the utilization of different ICT systems.

The mean of 4.10 and SD of 0.53 with 44% of respondents strongly agreed that their Network is secured enough to protect sensitive agricultural data from hackers. The mean of 4.02 and SD of 0.56 with 42% of respondents strongly agreed that the ICT system used in IFVP is simply to use for me. The mean of 2.84 and SD of 0.70 with 25% only of respondents agreed that In IFVP we have access to High-quality network infrastructure which ensure data transmission without disruptions. Thus, the overall mean of 3.72 tends to the highest score of 4 which implies that a big number of respondents agreed that the system quality is appreciated by the farmers at a great extent.

Views on Types of information and services in IFVP

The study sought to assess perception of respondents on the Types of information and services in IFVP. The respondents were questioned if agreed or disagreed with the statements with regard to Types of information and services within IFVP. The findings were presented in the following table 5.

Table 5: Views on Types of information and services in IFVP

Statement on Types of information and services	SD		D		UN		A		SA		M	SD
N=101	Fr	%	Fr	%	Fr	%	Fr	%	Fr	%		
ICT systems used IFVP facilitates access to a wider range of markets, including local, national, and international markets.	5	5	6	6	11	11	35	35	44	44	4.06	0.56
We are able to identify reliable buyers and negotiate favorable terms, thanks to our ICT systems	7	7	4	4	13	13	36	36	41	41	3.99	0.58
We always got guidance on agricultural practices thanks to ICT systems	2	2	4	4	10	10	47	47	38	38	4.14	0.45
Now we have access to weather forecasts and climate data which help us to plan our activities	11	11	17	17	15	15	33	33	25	25	3.47	0.67
There is no need for physical visits for the agronomist, as we ca get his guidance through ICT devices	9	9	14	14	17	17	34	34	27	27	3.55	0.63
Our ICT platforms offer us training materials, videos, and tutorials on various agricultural topics	8	8	10	10	8	8	37	37	38	38	3.86	0.62
We are able to apply for agricultural loans and credit through ICT systems	24	24	21	21	17	17	25	25	14	14	2.84	0.7
Through ICT devices, I have access to financial products and services anywhere and anytime.	22	22	21	21	17	17	24	24	17	17	2.93	0.68
Overall Mean											**3.84**	

Source: Primary Data (2024)

In relation to Types of information and services in IFVP, the results from table 5 indicated a mean of 4.06 and SD of 0.56 with most respondents 44% strongly agreed that ICT systems used IFVP facilitates access to a wider range of markets, including local, national, and international markets. The mean of 3.99 and SD of 0.58, with 41% of respondents strongly agreed that they are able to identify reliable buyers and negotiate favorable terms, thanks to our ICT systems. The mean of 4.14 and SD of 0.45 with 47% of respondents agreed that they always got guidance on agricultural practices thanks to ICT systems. The mean of 3.47 and SD of 0.67 with 33% of respondents agreed that now they have access to weather forecasts and climate data which help them to plan our activities.

Findings in Table 5 indicate also the mean of 3.55 and SD of 0.63 with 34% of respondents agreed that there is no need for physical visits for the agronomist, as they can get his guidance through ICT devices. The mean of 3.86 and SD of 0.62 with 34% of respondents agreed that ICT platforms offer them training materials, videos, and tutorials on various agricultural topics. The mean of 2.84 and SD of 0.70 with 24% of respondents disagreed that they are able to apply for agricultural loans and credit through ICT systems. The mean of 2.93 and SD of 0.68 with 21% of respondents strongly disagreed that through ICT devices, I have access to financial products and services anywhere and anytime.

Thus, the overall mean of 3.60 tends to the second score of 4 which is to a moderate extent which implies that a big number of respondents agreed that the information and services are appreciated at a moderate extent in IFVP project.

Views on the Project performance in IFVP

The study sought to assess perception of respondents on the project performance in IFVP as measured by Timeliness, Cost performance and Agricultural productivity. The respondents were asked whether agreed or disagreed with the statements regarding project performance, and the results were presented in the table 5.

Table 5: Views on the Project performance of IFVP

Statement on Project Performance	SD		D		UN		A		SA		M	SD
N=101	**Fr**	**%**	**Fr**	**%**	**Fr**	**%**	**Fr**	**%**	**Fr**	**%**		
Timeliness												
Thanks to ICT, I am able to make timely decisions about planting, irrigation, and harvesting.	11	11	10	10	7	7	39	39	34	34	3.74	0.66
ICT information allows me to avoid post-harvest losses due to delayed sales.	10	10	11	11	4	4	42	42	34	34	3.77	0.64
ICT devices has helped me to reduce delays in addressing issues and obtaining expert guidance	12	12	21	21	10	10	36	36	22	22	3.35	0.67
Cost Performance												
ICT has reduced significantly the labor cost I use in my farming activities	13	13	18	18	15	15	34	34	21	21	3.32	0.67
Thanks to ICT, I am now able to make informed decisions on when and where to sell my produce	7	7	11	11	20	20	37	37	26	26	3.63	0.59
Our ICT systems do require little energy consumption	10	10	9	9	16	16	34	34	32	32	3.68	0.64
Agricultural productivity												
The volume of my harvest has increased in the past years	14	14	11	11	13	13	24	24	39	39	3.62	0.72
I was able to increase my customer base	11	11	13	13	12	12	39	39	26	26	3.55	0.65
I am able to add value on my harvest	18	18	21	21	22	22	27	27	13	13	2.55	0.73
Currently I am using modern farming methods on my farm	11	11	10	10	7	7	39	39	34	34	3.74	0.66
											3.49	

Source: Primary Data (2024)

Considering Timeliness, the results from table 5 indicated that most respondents agreed that thanks to ICT, they are able to make timely decisions about planting, irrigation, and harvesting with the mean of 3.74 and SD of 0.66 with most respondents 39% agreed with the statement. The mean of 3.77 and SD of 0.64 with 42% of respondents agreed that ICT information allows them to avoid post-harvest losses due to delayed sales. The mean of 3.35 and SD of 0.67 with 36% of respondents agreed that ICT devices has helped them to reduce delays in addressing issues and obtaining expert guidance.

Considering cost performance in IFVP project, findings in Table 5 reveals a mean of 3.32 and SD of 0.67 with 34% of respondents agreed that ICT has reduced significantly the labor cost they use in their farming activities. The mean of 3.63 and SD of 0.59 with 37% of respondents agreed that thanks to ICT, they are now able to make informed decisions on when and where to sell their product. The mean of 3.68 and SD of 0.64 with 34% of respondents agreed that their ICT systems do require little energy consumption.

Considering agriculture productivity, the results from table 5 indicated that the volume of their harvest has increased in the past years with the mean of 3.62 and SD of 0.72 with most respondents 39% agreed with the statement. The mean of 3.55

and SD of 0.65 with 39% of respondents agreed that they were able to increase their customer base. The mean of 2.55 and SD of 0.73 with only 27% of respondents agreed that they were able to add value on their harvest. Finally, findings in Table 5 reveals a mean of 3.74 and SD of 0.66 with 39% of respondents agreed that currently they are using modern farming methods on their farm.

The performance in SPLK project scored the overall mean of 3.49 which implies that majority of respondents agreed that the performance of IFVP is achieved to a moderate extent.

Correlations Analysis

The correlation is one of the most common and most useful statistics. Linear correlation coefficient, measures the strength and the direction of association between the study variables was assessed using Pearson coefficient of correlation. The Pearson's coefficient of correlation ranges between +1 to -1. A zero (0) coefficient indicates that there is no association between the two variables. A coefficient value of greater than 0 indicates a positive relationship between the variables and hence an increase in the value of one variable leads to an increase in the other values of the other variable and the converse is true. A value less than 0 indicate a negative association between the variables that is as the values of one variable increases the values of the other variable decreases (Lohrey, 2014).

The study sought to determine the correlation between the independent variable ICT and the dependent variable project performance measured by Timeliness, Cost performance and Agricultural productivity. To calculate the correlation (strength) between the study variables and their findings the Survey Data used the Pearson's coefficient of correlation (r). The findings are presented in table 6.

Table 6: Correlation analysis between ICT and Project performance

		Timeliness	Cost performance	Agricultural productivity
ICT	Pearson correlation	.975**	.950**	.993**
	Sig. (2-tailed)	.000	.000	.000
	N	101	101	101

****. Correlation is significant at the 0.01 level (2-tailed).**

The results of the study in Table 6 show that there is a positive and significant relationship between ICT and project performance because the calculated Pearson correlation and significance level between ICT and Timeliness is strong positive and significant (r=0.975 and sig=0.000<0.01) level of significance. The calculated Pearson correlation and significance level between ICT and Cost performance is strong positive and significant (r=0.950 and sig=0.000<0.01) level of significance. The calculated Pearson correlation and significance level between ICT and Agricultural productivity is strong positive and significant (r= 0.993 and sig=0.00<0.01) level of significance. Thus, this implies that ICT plays a positive and significant effect on project performance in IFVP.

The results of this current research are supported by the results of the study of Oyelami *et al.* (2022) who investigated the effect of ICT infrastructure on agriculture sector performances in SSA using panel autoregressive distributed lag (ARDL) approach in Nigeria, and the results from the estimation provide substantial evidence to show that ICT infrastructure has positive externality on agricultural sector performances in the long run.

6. SUMMARY OF FINDINGS

This section presented the findings summary based on the research specific objectives such as to determine the contribution of ICT (ICT Tools, System quality, and types of information and services) on the timeliness in Imbaraga Farmers Voice Project, to assess the effect of ICT (ICT Tools, System quality, and types of information and services) on cost performance in Imbaraga Farmers Voice Project, and to analyze the influence of ICT (ICT Tools, System quality, and types of information and services) on agricultural productivity in Imbaraga Farmers Voice Project.

Influence of ICT on Timeliness in IFVP

The results of correlation analysis showed that there is a positive and significant relationship between ICT and project performance because the calculated Pearson correlation and significance level between ICT and Timeliness is strong positive and significant (r=0.975 and sig=0.000<0.01) level of significance.

The multiple regression between ICT and timeliness in IFVP proved that the adjusted R2 value is 0.965, which implies that predictors of ICT (ICT Tools, System quality, and Types of information and services) jointly accounted for 96.5% of the timeliness in IFVP. Further, the analysis of variance was used to examine whether the regression model was a good fit for the data. The F-calculated was 934.122 and was greater than the F-critical and the p-value was 0.000, which was less than the significance level (0.05). Therefore, the model was considered to be a good fit for the data.

Other factors being constant, ICT Tools increases the timeliness of IFVP per 0.390 units, System quality by 0.239 units, and Types of information and services by 0.529 units, meaning that ICT has an important effect on the timeliness in IFVP.

Effect of ICT on Cost performance in IFVP

The calculated Pearson correlation and significance level between ICT and Cost performance is strong positive and significant (r=0.950 and sig=0.000<0.01) level of significance.

The multiple regression between ICT and cost performance in IFVP proved that adjusted R-Square of 0.951 which indicates that the predictors of ICT (ICT Tools, System quality, and Types of information and services) jointly accounted for 95.1% of the cost performance in IFVP. This means that other factors not studied in this research contribute 4.9% to the Timeliness of IFVP. The F-calculated was 667.613 and was greater than the F-critical and the p-value was 0.000, which was less than the significance level (0.05). Therefore, the model is considered to be a good fit for the data and hence it implies that jointly ICT Tools, System quality, and Types of information and services have significant effects on the cost performance in IFVP.

Other factors being constant, ICT Tools increases the cost performance of IFVP per 0.605 units, System quality by 0.475 units, and Types of information and services by 0.297 units, meaning that ICT has an important effect on the cost performance in IFVP.

Influence of ICT on Agricultural productivity of IFVP

The calculated Pearson correlation and significance level between ICT and Agricultural productivity is strong positive and significant (r= 0.993 and sig=0.00<0.01) level of significance.

The multiple regression between ICT and Agricultural productivity in IFVP proved that the adjusted R-Square of 0.993 which indicates that the predictors of ICT (ICT Tools, System quality, and Types of information and services) jointly accounted for 99.3% of the Agricultural productivity in IFVP. Further, calculated F-Statistic of 4968.713 was large than the critical F and also because p-value calculated =0.000 is less than critical p-value=0.05 level of significant. This finding shows that the study model is significant and can be applied for the purposes of making predictions at 5% level of significance. Therefore, this implies that the variables: ICT Tools, System quality, and Types of information and services have significant effects on Agricultural productivity of IFVP.

Other factors being constant, ICT Tools increases the Agricultural productivity of IFVP per 0.466 units, System quality by 0.165 units, and Types of information and services by 0.134 units, meaning that ICT has an important effect on the Agricultural productivity in IFVP.

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