Global Scientific JOURNALS

GSJ: Volume 12, Issue 2, February 2024, Online: ISSN 2320-9186

www.globalscientificjournal.com

FACTORS INFLUENCING THE PERFORMANCE OF SUSTAINABLE AGRICULTURAL INTENSIFICATION AND FOOD SECURITY PROJECTS IN RWANDA

Aline Umwari

ABSTRACT

The study entitled" Factors Influencing The performance of Sustainable Agriculture Intensifications and Food Security Project RWANDA, a case study of cold room of SAIP in (Rulindo, Rwamagana,Gatsibo,Ngoma,Nyanza)

" The research is directed by four distinct objectives: To explore the effect of utilizing the Sustainable Agricultural Intensification and Food Security Project cold rooms, to determine the influence of using cold room on the horticulture value chain, to estimate the income level from horticultural output for farmers in the cold rooms of the Sustainable Agricultural Intensification and Food Security Project. To identify the challenges associated with implementing the Sustainable Agricultural Intensification and Food Security Project in cold rooms. The research design for the study will be descriptive and regression analysis. The study's population will include 872 stakeholders composed by 62 employee and 810 beneficiaries of cold room of SAIP project in Rwanda. The questionnaire will be used to gather data for the study, and descriptive statistics and regression analysis will be utilized to analyze the results.

INTRODUCTION TO THE STUDY

Horticultural farming, encompassing the cultivation and sale of perishable products like fruits, vegetables, and flowers, is considered agribusiness and is notably profitable, outperforming tea farming by a significant margin. Recent years have seen a dramatic expansion in fresh fruit production and consumption globally, driven by escalating market demand. However, challenges such as mechanical damage post-harvest can lead to negative physiological and biochemical alterations, underscoring the need for optimal logistics to maintain fresh produce quality.

Project success globally hinges on the ability to create integrated information and control systems to effectively manage resources and meet project objectives. Challenges in project management include adhering to predetermined limits related to scope, time, quality, and budget. The demand for temperature-controlled food and nonfood commodities has surged in regions

like Asia and Latin America, prompting significant investments in logistics to meet market demands.

Success in horticultural projects, as seen in Ghana, relies on effective supply chain management and product diversification. However, cold chain infrastructure in Sub-Saharan Africa, particularly in countries like Nigeria, remains underdeveloped. East African countries like Kenya have seen the emergence of cold chain projects driven by factors such as increased exports and growing domestic consumption.

In Rwanda, horticultural exports are growing, albeit from a low base, with government programs and development initiatives fueling industry growth. Challenges include a lack of investment in cold chain infrastructure, resulting in post-harvest losses and reduced profitability for smallholder farmers. Government efforts to promote the development of a contemporary cold chain aim to address these challenges and meet the rising consumer demand for quality products.

In summary, horticultural farming presents significant opportunities for economic growth, but challenges such as inadequate cold chain infrastructure and post-harvest losses need to be addressed through comprehensive strategies at the global, regional, and local levels.

Statement of the Problem

Cold chains play a crucial role in horticulture value chains by preserving food quality and reducing losses, a significance expected to increase with economic development, urbanization, and rising consumer expectations. However, energy use in cold chains poses environmental and cost challenges, necessitating awareness of the latest techniques and their implications. Despite the importance of cold storage, investing in it requires consideration of various factors influencing success or failure.

In Rwanda, the small-scale nature of farming exposes producers to significant risks with limited mitigation options. Challenges include risk and uncertainty at production, post-harvest, and marketing stages, exacerbated by immature financial markets hindering access to necessary capital. Consequently, farmers struggle with limited technology uptake and adoption of modern practices due to high costs and risks. Additionally, reliance on low-value crop selection like maize and beans, which offer minimal returns per hectare compared to higher-value crops such as horticulture, further impedes economic progress for smallholder producers.

Research Questions

The researcher will be guided by the following research questions.

i. What is the effect on utilizing Sustainable Agriculture Intensification and food security Project cold rooms?
ii. What is the influence of Sustainable Agriculture Intensification and Food Security project on horticulture value chain?
iii. What is the level of income from horticulture produce?

iv. What are the challenges on using Sustainable Agriculture Intensification and Food security project cold rooms?

The study descriptive analysis (frequencies, percentages, mean,) will be used to present counts, averages, and proportion. Regression analysis will be used to quantify correlation between dependent and independent variables.

The population of the study is small holder farmers around the premises of the 10 cold rooms of SAIP project including 10 operators of SAIP Cold rooms.

. Sample size

$$n = \frac{N}{1 + N(e)^2}$$

The study used Slovin's Formula to determine the sample size that was used in data collection because 872 small hold farmers of Cold chain of SAIP project is large which is great than 100, therefore the sample size is calculated as follows:

Where: n= the sample size,

N= Population size and

e= the margin of error (5%).

$$n = \frac{820}{1+820\ (0.05)^2} = \frac{820}{3.18} = 268.8 \approx 269$$

The study will collect data on 269small holder famers around SAIP cold rooms.

Population size

Categories of Cold chain of SAIP project	**Population size**
Project manager	1
Quality Improvement Coordinator	5
MEAL departments	5
Finance and accounting department	4
HRM departments	7
Procurement office	6
Field operation Technician	24
Project support officer	10
Total employees	**10**
Beneficiaries	**810**
Total stakeholder	**820**

Source: SAIP project report, 2021

RESEACH FUNDING AND DISCUSSION

The study provides a comprehensive analysis of various factors related to smallholder farmers' engagement with SAIP (Smallholder Horticulture Development and Post-harvest Management Project) cold rooms in Rwanda. Here's a summarized overview of the key findings:

1. **Respondents by District**: The majority of respondents were from Rulindo district (29%) followed by Nyanza (24%). This distribution is attributed to the presence of SAIP cold rooms in Rulindo.
2. **Respondents by Age**: The majority of participants (27%) fell within the 21-30 age range, indicating a significant presence of young farmers in the horticulture value chain.
3. **Respondents by Gender**: The study found a gender imbalance, with 59% male and 41% female respondents, reflecting the gender dynamics in the agricultural sector.
4. **Respondents by Education Level**: Most respondents (35%) had attended primary school, highlighting the need for educational interventions in the farming community.
5. **Respondents Monthly Income Level**: The majority of respondents earned between 10,001-25,000 Rwf monthly, indicating low to moderate income levels among smallholder farmers.
6. **Plot Information**: On average, smallholders cultivated 14,174.26 square meters of land, yielding an average production of 2,970.99 kg per farmer.
7. **Transport System**: Bicycle was the most commonly used mode of transportation (47%), followed by foot (31%) and motorcycles (24%).
8. **Post-Harvest Losses**: Significant post-harvest losses were observed, especially in vegetables, with cabbage and chili being the most affected crops.
9. **Perception on Using SAIP Cold Room**: Respondents perceived the source of energy as the most significant factor influencing the performance of the cold room.
10. **Regression Analysis**:
    - The study investigated factors influencing the usage, awareness, and income related to SAIP cold rooms. However, the results indicated that most factors were not statistically significant in influencing these outcomes.

Overall, the study highlights the challenges and opportunities associated with smallholder farmers' engagement with SAIP cold rooms, including the need for addressing post-harvest losses, improving transportation infrastructure, and enhancing awareness and education among farmers.

4.13 ANOVA

Table17 Analysis of Variance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	46.538	1	15.318	38.78	.000[b]
	Residual	5.881	211	.082		
	Total	52.420	212			

a. Dependent Variable: PII

b. Predictors: (Constant), Income, Awareness,

1.

- **Regression Sum of Squares**: This is the sum of squared differences between the predicted values of the dependent variable (PII) and the mean of the dependent variable.
- **df (Degrees of Freedom)**: This represents the number of independent pieces of information that went into the estimate (predictors - 1).
- **Mean Square**: This is the mean of the sum of squares, calculated by dividing the sum of squares by the degrees of freedom.
- **F-value**: This is the ratio of the mean square of the regression (explained) to the mean square of the residuals (unexplained). It tests whether the overall regression model is statistically significant.
- **Sig. (Significance Level)**: This is the p-value associated with the F-value. It indicates the probability of obtaining the observed F-value by random chance if the null hypothesis (that all regression coefficients are zero) were true. A small p-value (typically < 0.05) suggests that the regression model is statistically significant.

2. **ANOVA Table**:

- **Regression**: This row shows the sum of squares, degrees of freedom, mean square, F-value, and significance level for the regression model.
- **Residual**: This row shows the sum of squares, degrees of freedom, and mean square for the residuals (unexplained variability).

- **Total**: This row shows the total sum of squares and degrees of freedom.

Interpretation:

- The regression model as a whole (with predictors Income and Awareness) is statistically significant, as indicated by the very small p-value ($p < 0.001$).
- The regression explains a significant amount of the variance in the dependent variable "PII," as evidenced by the high F-value (38.78).
- The regression sum of squares is 46.538, indicating that the model explains a substantial portion of the total variability in "PII."
- The residual sum of squares is 5.881, representing the unexplained variability in "PII" after accounting for the effects of the predictors.
- The total sum of squares is 52.420, which is the sum of the regression sum of squares and the residual sum of squares.

Overall, this ANOVA table suggests that the regression model with Income and Awareness as predictors significantly explains the variation in the dependent variable PII.

Recommendation

The following were the recommendations of the study.

- Organization should concentrate on needs of the stakeholder in order to implement project effectively.
- For effective continual improvement in performance of the project there should be data analysis, audit results and training of staffs. This will reduce errors and mistakes in service delivery.
- Create an awareness campaign: To solidify thorough understanding, the team will conduct an awareness campaign to sensitize stakeholders on ownership and management. It is recommended that the campaign have a general sentiment that. encourages farmers to utilize cold rooms, additionally, the campaign can be tailored. to meet each district's needs.
- Every organization should adopt quality management policy to keep in track of offering best quality services**.**

6. REFERENCES

Adebayo, O. O.and Adeola, R. G. (2008). Sources and uses of agricultural credit by small scale farmers in Surulere local government area of Oyo State. *Anthropologist, 10*(4), 313-314.

Ashok, A., Brison, M. & LeTallec, (2017), "Improving cold chain systems: challenges and solutions", 35(17), 2217-2223.

Balungi, B. (2016). Post-harvest handling technologies and maize farmers' income in mid-west uganda, masindi and Kiryandongo Districts. *Journal of Economic Literature,3*(8), 332 - 382

Bokusheva, R., Finger, R., Fischler, M., Berlin, R., Marlin, Y., Perez, F. et al (2012). Factors determining the adoption and effects of a post-harvest storage technology.

Browning, G., Halcli, A., and Webste, F. (2000). Rational Choice Theory. Understanding Contemporary Society: Theories of the Present.

Chepchirchir , M.L.& Achuora, J.(2021).Cold chain logistics and the performance of fresh produce firms in nairobi city county, Kenya . *International Research Journal Publishers, 2*(2), 489-504.

Costa S.J. (2015). Taking it to scale: Post-Harvest Loss Eradication in Uganda 2014 – 2015.Project Implementation Report. UN World Food Programme, Kampala, Uganda.

Costa, S. J. (2014). Reducing food losses in sub-Saharan Africa (improving post-harvest management and storage technologies of smallholder farmers). An 'action research'evaluation trial from Uganda and Burkina Faso. UN World Food Programme, Kampala, Uganda.

Emenike, C. C. Van Eyk N. P. & Hoffman, A. J. (2016). Improving Cold Chain Logistics through RFID temperature sensing and Predictive Modelling. IEEE 19th International Conference on Intelligent Transportation Systems (ITSC), Rio de Janeiro, 2331-2338.

FAO (2015). On-farm post-harvest management of food grains. A manual for extension workers with special reference to Africa.Agricultural and Food Engineering Training and Resource Materials. ISBN: 978-92-5-106327-9

FAO. (2011) .*Global food losses and food waste-extent, causes and prevention*. FAO, Rome, Italy.

Gathiru, N. (2014). Factors Influencing Sustainability of Donor Funded Projects: The Case Of Water and Sanitation Projects In Laikipia East District, Laikipia County, Kenya. *International Review of Management and Business Research, 2*(1), 36–40.

Iqbal, M., A. Munir& K. Abbas, (2003). The impact of institutional credit on agricultural production in Pakistan. *The Pakistan Development Review,42*(4), 469–485.

Irungu, J.W. (2013).Relationship between agricultural credit financing and financial performance: a case of small scale farmers in Kiria Division in Maranga County. *Journal of the Academy of Marketing Science, 33*(10), 295-312

Kaaya, A. N., and Nyamuragira, W. (2006). The effect of storage time and agroecological zone on mound incidence and aflatoxin contamination of maize from traders in Uganda. *Internal Journal of Food Microbial, 110*(3),217-223.

Kibaara, B. (2006). he role of agricultural credit in the growth of livestock sector: A case study of Faisalabad. Pakistan Vet. J, 29(2), 81-84

Kimata, J.N., McConchie, R. , Xiuyuan, X ., and Nguluu, S., N. (2012). The significant role of post- harvest management in farm management, aflatoxin mitigation and food security in sub-saharan Africa. *Greener Journal of Agricultural Sciences,2* (6), 279-288

Lama. M, McEvoy. A, Parker. S, and Robbins. K. (2014). An analysis of market systems approaches to agricultural development in Uganda and Tanzania. Accessed from: https://elliott.gwu.edu/sites/elliott.gwu.edu/files/downloads/BRAC.pdf. On 18th August 2015

Mamburi, N. (2014). Factors Influencing Community Ownership of Water Projects in Kenya; A Case of Kinna Division Isiolo County. *International Journal of Business and Management, 2*(1), 14–19.

Mochiemo, E. (2014). Factors Influencing Sustainability Of Water Projects In Slum Areas Of Nairobi County: A Case Of Maji Ni Maisha Water Projects. *Journal of Business and Management, 2*(1), 25–29.

Munyao, M. T. (2013). Implications of Water Supply and Sanitation Projects on the Livelihoods of Slum Dwellers in Kenya : a Case of Kosovo Village in Mathare Constituency , Nairobi County.

Mutinda, K. (2013). Factors Influencing Sustainability Of County Funded Projects In Mbooni Sub County, Makueni County-Kenya. *International Journal of Business and Social Research, 2*(2), 14–19.

Mwangi, W. (2015). The Factors Influencing Sucess of Constituency Development Projects in Nyeri County, Central Province, Kenya. *IOSR Journal of Business and Management (IOSR-JBM), 2*(3), 65–72.

Mwende M. A.(2018).Influence of community participation on performance of development projects in Makueni county, Kenya. *American Journal of Agricultural Economics,90*(2),409–423

Mwangi,J.(2016).Factors influencing horticultural production in Kenya: a case of farmers sponsored by nongovernmental organizations in Muranga County, Kenya. *Eastern Africa Journal of Rural Development, 21* (1), 55 - 64

Ndagi,K.& Rambo.S. (2016). Influence of M&E Planning on Sustainability of agricultural food crop projects in Kenya. Nairobi, Kenya: Ekon publishers

Ngure, E.W. (2013). determinants influencing performance of agricultural projects: a case of NALEP projects in Ruiru District, Kiambu County, Kenya. *Impacts of Agriculture on Human Health and Nutrition, 2* (1), 476 – 488

Adoyo J. A. (2016). Factors influencing the performance of horticulture projects in Kenya; a case of Bahati Constituency, Nakuru County. *IOSR Journal of Business and Management, 1*(3), 47–49.

Ofuoku,A. U. (2011).Effect of community participation on sustainability of rural water projects in Delta Central agricultural zone of Delta State, Nigeria. *Journal of Agricultural Extension and Rural Development,3*(7),130-136

Okoruwa, V.O., Ojo, O.A., Akintola, C.M, Ologhobo, A.D. and Ewet, F.K. (2009). Post-Harvest Grain Management Storage Techniques and Pesticides Use by Farmers in South-West Nigeria. *Journal of Economics and Rural Development, 18*(1),102-118.

Rao, S., Naftar, S., Baliga, s, & Unnikrishnana, B. (2016). Evaluation, Awareness, Practice and Management of Cold Chain at the Primary Health Care Centers in Coastal South India. *Journal of Nepal Paediatric Society, 32*(1), 19-22.

Riaz, A., Khan, G. A., and Ahmad, M. (2012). Utilization of agriculture credit by the farming community of Zarai Tariqiati bank limited (ZTBL) for agriculture development. *Pak. J. Agri. Sci, 49*(4), 557-560

Rugumamu, C. P. (2009), Assessment of post-harvest technologies and gender relations in maize loss reduction in Pangawe Village Eastern Tanzania. Tanzania. *Journal of Science,2*(6),12-22.

Saif, A. & Elhedhli, S. (2016). Cold supply chain design with environmental considerations: a simulation-optimization approach. *European Journal of Operational Research, 251*(1), 274-287.

Shabani, A., Torabipour, S.M.R. & Saen, R.F. (2015), "A new super-efficiency dual-role FDH procedure: an application in dairy cold chain for vehicle selection. *International Journal of Shipping and Transport Logistics,71*(4) 426-456.

Shashi, Cerchione, R., Singh, R., Centobelli, P., & Shabani, A. (2018). Food cold chain management: From a structured literature review to a conceptual framework and research agenda. *International Journal of Logistics Management, 29*(3), 792-821.

Shukla, M. & Jharkharia, S. (2017), "Agri-fresh produce supply chain management: a state-ofthe-art literature review", International Journal of Operations & Production Management, 33(2), 114-158

Suleiman, R. A. and Rosentrater, K. A. (2013). Effects of deterioration parameters on storage of maize. Agricultural and Biosystems Engineering. Accessed from: http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1324&context=abe_eng_conf. On 18th July 2015

Tao, Shi, & Wen, H. (2017). Optimization of vehicle routing problem with time windows for cold chain logistics based on carbon tax. Sustainability, 9(5), 694.

Thamaga-Chitja, J. M., Hendriks, S. L., Ortmann, G. F., and Green, M. (2004). Effects of maize storage on rural household food security in Northern Kwazulu-Natal. *Tydskrif vir Gesinsekologie en Verbruikerswetenskappe, 32* (8),185-200.

USAID. (2016). The fresh fruit and vegetable markets of East Africa: An assessment of regional value chain actors, activities and constraints in Kenya, Tanzania and Uganda

Xing, M.M. & Chang, (2015), "Temperature management for the quality assurance of a perishable food supply chain", Food Control, 40, 198-207.

Yahia, E.M. (2016). Postharvest technology of food crops in the Near East and North Africa (NENA) region. p.643-663. In: R. Dris (ed.), Crops: Quality, Growth and Biotechnology. WFL Publisher, Helsinki, Finland.

Wambugu, M. J. (2010). The factors influencing success of constituency development find in Nyeri County, central province Kenya. Unpublished Masters thesis, Kenyatta University.

World Bank. (2009). *A study of the regional maize market and marketing costs*. Eastern Africa

World Bank. (2015). *Economic and sector work missing food: The case of post-harvest grain losses in Sub-saharan Afric*a.