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Impact Investing in Sustainable Agricultural Technologies and Sustainable Livelihoods for Dairy Farmers

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Abstract— The goal of the study was to determine how dairy producers' sustainable lives are impacted by sustainable agricultural technologies. The study used a descriptive research design. 22,644 farmers who were spread over the 5 Wards of Githunguri Sub County in Kiambu County, Kenya, made up the target population. A stratified random sampling technique was used to randomly choose the sample in each of the five wards, and the Yamane Sampling formula was applied to generate a sample of 398 respondents. The study used quantitative data, which was gathered using a standardized questionnaire. A combination of inferential and descriptive statistics was used to analyze the collected data. The analysis's findings demonstrated that sustainable agriculture methods have a major and favorable impact on sustainability.

Index Terms— Impact Investing in Sustainable Agricultural Technologies, Sustainable Livelihoods, Dairy Farmers.

1. INTRODUCTION

As a theme for sustainable consumption and production (SCP) and impact investing, [1] posits that agricultural and food systems provide key entry points for investors to finance long-term and sustainable food solutions while at the same time creating wealth and a healthy community within ecological favorable limits. Adopting a full portfolio approach towards sustainable agriculture allows investors to grapple with numerous opportunities for investment since each opportunity bears its benefit to agricultural practices.

In the agricultural sector, maize is one of the staple foods consumed in Kenya, accounting for about 14% of income for rural households. Many small-scale farmers use farm-saved seeds yielding irregular and minimal outcomes. Whereas high-breed seeds are perceived to produce more yields, farmers have low adoption rates associated with insufficient supply and distribution and limited marketing strategies. Firms such as Western Seeds Company have come to the rescue of farmers by developing hybrid varieties of maize seeds that guarantee farmers more yields than traditional seeds. Additionally, the company has a marketing program called Direct Access Sales that markets the hybrid seeds directly to farmers in remote rural areas where traditional seeds are extensively planted [2]. By availing hybrid maize seeds to farmers, the company has assisted farmers in enhancing their maize production culminating in increased sales and income.

Despite the importance of dairy farming to the economy, dairy farmers in Githunguri Sub County face numerous challenges such as poor livestock breeds brought by inadequate Artificial Insemination services, and poor local breeds and genetics. Additionally, farmers face the challenge of low milk production due to poor quality of animal fodder and feeds, poor and inefficient disease control mechanisms, high cost of animal feeds, unskilled workforce, declining land sizes, inefficient avenues for marketing their milk, and low producer prices for the raw milk.

Consequently, many farmers lack avenues and resources for value addition thus rendering them low profits and returns. These challenges have prompted various entities such as financial institutions and dairy companies to invest in dairy farmers to impact their livelihoods through boosting their daily farming practices. It is, however, not proven yet whether sustainable agricultural technologies affect the sustainable livelihoods of dairy farmers operating in the Githunguri sub-county [3].

Impact investing in sustainable agricultural technologies is projected as the remedy to the prevailing problems, to ensure the attainment of sustainable livelihoods for dairy farmers. These challenges have prompted various entities e.g. financial institutions and dairy companies investing in dairy farmers to impact their livelihoods through boosting their dairy farming practices.

This study is occasioned by Limited empirical studies measuring the impact of sustainable agricultural technologies on the livelihoods of dairy farmers [6,8,10] and also limited research in developing countries, leaving a gap in understanding its influence in developing nations where dairy farming is a crucial livelihood economic contributor [4,5]. On the other hand, [4] assessed how investments in large-scale agricultural activities impact Southeast Asian communities, revealing that the investors positively impacted communities by creating employment, conserving the environment through cultivating degraded

lands, and increasing the income to the communities. Another study by [5] assessed the long-run returns on Impact Investing focusing on Developing Economies and Emerging Markets and established no correlation. A study by [6] focused on evaluating how impact-investing influences finance and farming activities in Southern Tanzania Highlands establishing that impact investors provided farmers with avenues for upgrading their farming activities through the provision of farming inputs and technical services. As documented above, the current studies have not revealed a clear relationship between sustainable agricultural technologies and the sustainable livelihoods of dairy farmers. Based on these gaps, this study aimed to determine the effect of sustainable agricultural technologies on the sustainable livelihoods of dairy farmers in Githunguri Sub County.

2. **LITERATURE REVIEW**

Impact investing in sustainable milking technologies ensures that farmers introduce automated milking systems that are efficient, promoting minimal wastage, reducing costs of labor, and saving time. Additionally, the technology ensures minimal milk contamination thus retaining milk quality. [7] note that high quantities of milk can be achieved through effective milking technologies.

The adoption of technology has been perceived as a key driver to the profitability and productivity of farms thus culminating in farmers' economic sustainability. Innovations as assessed through indexes that combine knowledge acquisition, technology adoption, and continuity in innovation contribute to farming economic sustainability indicated by land productivity, profitability, and orientation in markets.

Investing in sustainable agricultural technologies guarantees farmers' continued productivity, increasing their profitability. Hence, investment companies that may consider providing farmers with technological support must first evaluate the difficulties that farmers have in their field of work. As a result, the companies must determine whether their investment is viable and whether it would benefit both the farmers and the investing companies. [7] posits that it is imperative to assess if the proposed technological investment serves to augment or stifle agricultural practices. This ensures that the farmers only need to accept firms that invest in agricultural technologies that promote and enhance their farming activities.

[8] sought to identify the behavioral factors that affect the adoption of sustainable farming practices. The study employed an empirical review spanning 20 years from farmers in Europe. The behavioral factors comprised were categorized into social, dispositional as well as cognitive. Dispositional factors for the adoption of sustainable agricultural practices comprised of new experience openness, extraversion, risk-seeking, environmental and moral concern, and farming objectives lifestyles. Cognitive factors are associated with reasoning and learning sustainable farming practices. The study established that adopting these practices was higher among farmers with sufficient competence and knowledge in impact investing in sustainable practices, especially when they adopted practices that bear financial and environmental benefits at lower risks. Social factors are concerned with interpersonal relationships amongst farmers, there is a high likelihood of the adoption of sustainable practices by farmers with neighbors who have already adopted the practices.

[9] conducted a study about what determines the adoption of technologies in dairy farming focusing on rural women operating in Kakamega County. The study employed a descriptive survey research design with a target population of 72 rural women involved in dairy farming. FGDs, observational guides, and questionnaires formed the main data collection instrument. Descriptive statistics were applied in analyzing the quantitative data while verbatim and themes were utilized in analyzing the qualitative data. The results identified the level of awareness of exotic cow breeds, fodder, and technologies for conservation as the main technologies in dairy farming. However, the level of technology adoption was determined by socialization norms that advocated for power hierarchy in rural households.

[10] sought to establish the extent of agricultural technology adoption using a panel analysis on fertilizer usage by Kenyan farmers. The study was occasioned by the need to increase agricultural productivity which had deteriorated and increased poverty levels. The study employed a survey approach and targeted 1275 households. A multistage sampling technique was utilized in selecting the districts while a proportional sampling method was used in selecting the households. The study employed a double hurdle model over 10 years through a panel data survey. The results of the panel regression model established that households using fertilizer technologies had dramatically increased. The study further established that the adoption of fertilizer technology was significantly influenced by the level of education, credit accessibility, education, market distance, and ecological potential.

3. RESEARCH METHODOLOGY

A descriptive research design was adopted to generate both descriptive and numerical data that was crucial in explaining the relationship between the variables.

The target population of the current study comprised 22,644 dairy farmers registered with the cooperative as shown in Table 3.1.

Table 3.1 Target Population

Ward	Target Population	Percentage
Githiga	3791	16.70%
Githunguri	7986	35.30%
Ikinu	2631	11.60%
Komotha	5571	24.60%
Ngewa	2665	11.80%
Total	**22644**	**100**

The study employed a Yamane (1967) sampling formula in deriving a sample of 398 respondents. The formula is presented below:

$$n = \frac{N}{1 + Ne^2}$$

Where n= sample size
N= target population
e= acceptable sampling error

The study was conducted at 5% level of significance.
Substituting the values in the formula,

$$n = \frac{22644}{1 + 22644(0.05)^2}$$

n =398

A stratified random sampling technique was adopted in the study to select the sample population in the five wards. The distribution of the sample size is presented in Table 3.2.

Table 3.2 Sample Size

Ward	Target Population	Sample	Percentage
Githiga	3791	66	16.70%
Githunguri	7986	141	35.30%
Ikinu	2631	46	11.60%
Komotha	5571	98	24.60%
Ngewa	2665	47	11.80%
Total	**22644**	**398**	**100**

The study relied on primary data using semi-structured questionnaires using the drop-and-pick method and email follow-ups to enhance the response rates.

The pilot study adopted 5% of the sample size i.e. 20 respondents at Githunguri Sub-County to test the instruments. The respondents in the pilot study were exempted from the main study. Reliability was tested using Cronbach's Alpha test while content validity involved the supervisor evaluating the data collection tool and construct validity involved factor analysis where a factor loading value of 0.5 was adopted as a threshold.

SPSS computer software version 22 was employed to generate both descriptive and inferential statistics. The results of the study were summarized and presented through tables and figures.

The study adopted the following multivariate model to establish the relationship between sustainable agricultural technologies and the sustainable livelihood of farmers.

$\mathbf{Y} = \beta_0 + \beta_1 X_1 + \varepsilon$

Where;

$\mathbf{Y}$ = Sustainable livelihood of farmers

$\mathbf{X_1}$ = Impact Investing in sustainable agricultural technologies

$\boldsymbol{\varepsilon}$ = Error term

β_0= Regression constant or intercept

β_1= unknown coefficients of independent variable impact investing in sustainable agricultural technologies.

The study conducted diagnostic tests to ensure that ordinary least square assumptions are satisfied before the multiple linear regression is conducted. The diagnostic tests conducted comprised: a linearity test, normality test, and homoscedasticity test.

4. RESEARCH FINDINGS AND DISCUSSION

4.1 Response Rate

A total of 398 questionnaires were issued to the target respondents comprising dairy farmers operating in Githunguri Sub County. 284 questionnaires were returned having been filled. This represented a response rate of 71.4%. The response rate was perceived to be enough and sufficient for analysis as per the argument formulated by [11] who argued that a response rate of 70% or above is excellent for analysis. Figure 4.1 shows the response rate.

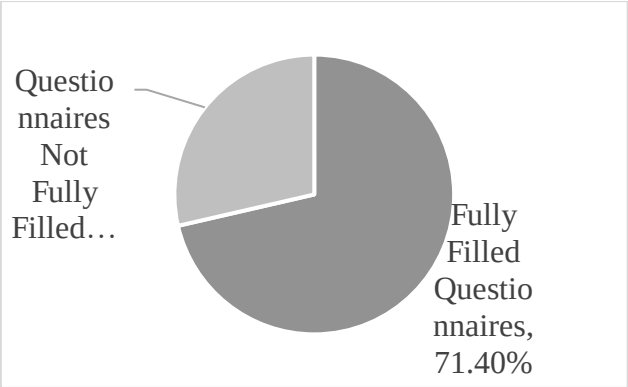

Figure 4.1: Response Rate

4.2 Pilot Test Summary Results

A pilot study was conducted to enable the researcher to improve the data collection instrument thus enhancing the data collection process. [11] assert that a suitable pilot study should cover 5-10% of the sample size. The current study adopted 5% of the sample size which comprised 20 respondents. This involved issuing 20 questionnaires to randomly selected farmers in the Subcounty. The respondents in the pilot study were exempted from the main study.

4.2.1 Reliability Test Results

[14] defines reliability as the level of consistency of measurements in a research instrument. Reliability measures the consistency of instruments, and whether they can yield similar results when subjected to comparable conditions (Cronbach, 1951). The study applied reliability analysis to assess the internal consistency of the study variables. Cronbach's Alpha coefficient was computed on all components of the questionnaire and their assessment. An alpha of 0.7 was used in this study as a threshold. The results presented in Table 4.1 show that the Cronbach Alpha value was above the threshold of 0.7 implying that the variables were all reliable in assessing respective aspects of the study.

Table 4.1: Reliability Test Results

Scale	Cronbach's Alpha	Number of Items	Comment
Sustainable Agricultural Technologies	0.876	5	Reliable
Sustainable Livelihoods of Dairy Farmers	0.901	4	Reliable

4.2.2 Validity Test Results

Validity is the extent to which an instrument measures what it is supposed to measure. Validity shows the truthfulness and accuracy of data and inferences that can be acquired from the data [14]. The current study applied both content and construct validity to measure the extent to which the selected items contained in the sample represent the content being measured by the

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test. To ensure content validity, the researcher involved the supervisor in assessing the concepts of the questionnaire and in determining whether it measures what it purports to measure. The supervisor's comments, advice, and viewpoints were used to improve the questionnaire's items to make sure they contained the information they were intended to.

Construct validity was assessed through component factor analysis where a factor loading value of 0.5 was adopted as a threshold. The goal of component factor analysis is to identify the questionnaire items that represent the same characteristics of a variable. Each item should target a particular element of a variable, therefore items that capture similar aspects should be eliminated or changed, according to Richard (2011). CFA results indicated that none of the items was eliminated since they all had factor loading values over 0.5 and therefore addressed each variable uniquely. The items were regarded as valid for use in the main study for data collection.

4.3 Demographic Characteristics Results

The study included the demographic results to describe the nature of respondents. The demographics included in the study comprise gender, ward, level of education, number of years in dairy farming, and monthly income from dairy farming.

4.3.1 Gender of Respondents

The results on gender presented in Figure 4.2 show that male dairy farmers were 61.3% while female dairy farmers were 38.7%, implying that both genders were represented in this study. The results implied a big percentage of dairy farming in Githunguri Sub County is undertaken by the male gender.

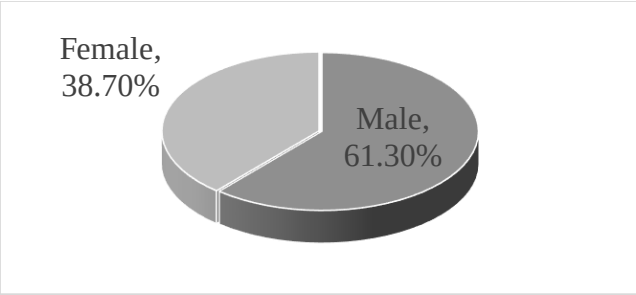

Figure 4.2: Gender Distribution

4.3.2: Respondents Ward Representation

The results on the ward from where the respondents came from as outlined in Figure 4.3 show that those from Githiga Ward were 20.9%, Githunguri were 34.5%, Ikinu were 11.2%, Komotha were 24.6% while Ngewa accounted for 8.8%. The results show that the majority of the respondents came from the Githunguri ward. The findings imply that all wards were well represented in this study.

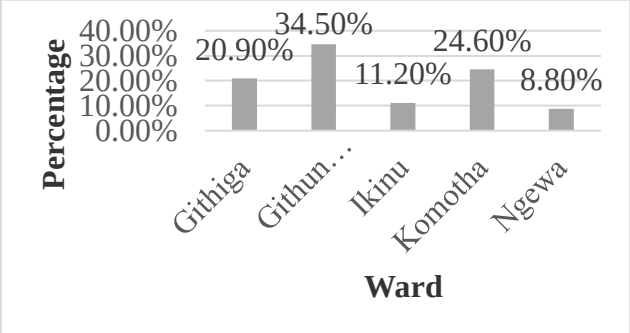

Figure 4.3 Respondents Ward Representation

4.3.3 Respondents Highest Level of Education

The results on the level of education of respondents outlined in Figure 4.4 shows that those with a secondary level of education were 49.6%, college was 27.5%, graduates were 22.9% and none of the respondents had a doctorate. The results show that the majority of the respondents had attained secondary education. Additionally, all respondents involved in the study were educated, implying that they were in a position to read, understand, and respond to the contents of the questionnaire. The findings on the highest level of education imply that respondents were qualified to respond to study questions.

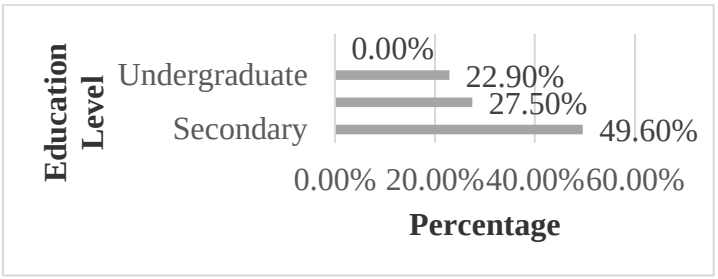

Figure 4.4: Respondents Highest Level of Education

4.3.4 Respondents Number of Years in Dairy Farming

The results on the number of years of respondents in dairy farming presented in Figure 4.5 show that 16.3% were in dairy farming for less than 5 years, 33.5% between 5 and 10 years, 30.4% between 11 and 15 years while those with above 15 years accounted for 19.8%. The results show that the majority of the respondents have been in dairy farming for more than 5 years. This implies that respondents were experienced in responding to the study questions favorably.

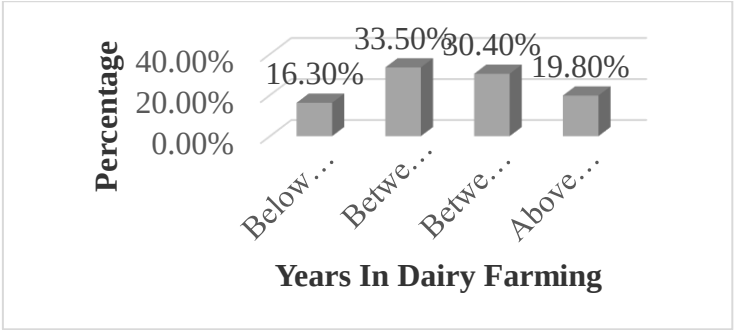

Figure 4.5 Number of Years in Dairy Farming

4.3.5 Monthly Income from Dairy Farming

The study sought to establish the monthly income of the respondents from dairy farming. The results in Figure 4.6 show that 20.7% of the respondents had a monthly income of below Ksh. 10,000, 33.8% between Ksh. 10001 and Ksh. 30000, 28.5% between Ksh. 30001 and Ksh. 50000 while 17% had a monthly income of above Ksh. 50000. The results show that the majority of the respondents had a monthly income from dairy farming of above Ksh. 10000 and that all the respondents were deriving an income from dairy farming hence suited to respond to the study questions.

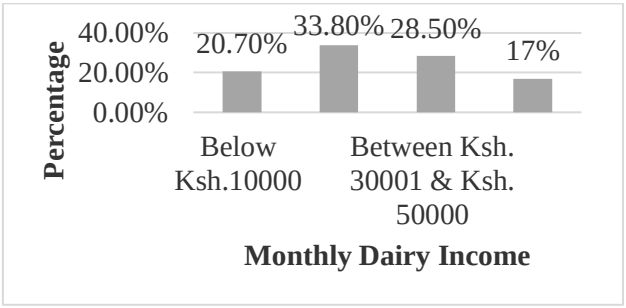

Figure 4.6 Monthly Income from Dairy Farming

4.4 Descriptive Statistics

The inclusion of descriptive statistics in the study was aimed at describing the nature of the responses of respondents on various items on the questionnaire. In the questionnaire, the statements addressing each variable were formulated on 1-5 Likert scale where respondents were supposed to indicate the degree of agreement or disagreement on various statements. The study then derived the mean response and standard deviations per statement to conclude the nature of the response.

4.4.1 Sustainable Agricultural Technologies

The descriptive results on sustainable agricultural technologies outlined in Table 4.2 show that respondents agreed with the statements that the firm provides advanced technologies for milking(mean=4.06), that the firm provides advanced technologies for milk storage(mean=3.94), that the firm provides advanced technologies for administering medication(mean=3.99), that the

technologies reduce the spoilage levels of milk(mean=3.87) and that the technologies enhance production efficiencies(mean=3.75). All respondents agreed with the statements on sustainable agricultural technologies as shown by the average response mean of 3.92 and average standard deviation of 0.594. The results imply that sustainable agricultural technologies provided to farmers enable them to enhance their dairy farming activities and improve their levels of production and livelihoods. According to [7], investing in sustainable agricultural technologies ensures the existence of production continuity among farmers and raises their profit levels.

Table 4.2: Descriptive Statistics on Sustainable Agricultural Technologies

Statement	Mean	Standard Deviation
The firm provides advanced technologies for milking	4.06	0.215
The firm provides advanced technologies for milk storage	3.94	0.611
The firm provides advanced technologies for administering medication	3.99	0.618
The technologies reduce the spoilage levels of milk	3.87	0.724
The technologies enhance production efficiencies	3.75	0.803
Average	**3.92**	**0.594**

4.4.2 Sustainable Livelihoods of Dairy Farmers

The study first sought to assess the changes in the form of a percentage of the income of dairy farmers as a result of sustainable investing technologies. The results presented in Figure 4.7 show that the level of income of 10.4% of farmers had increased below 10%, 24.8% of farmers had increased between 10% and 20%, and 22.7% of farmers had recorded an increase of between 21% and 30%. Those farmers who had recorded an increase of between 31% and 40% were 20.3%, between 41% and 50% were 12.5% while those with above 50% accounted for 9.3%. The results show that all farmers involved in the study had recorded a certain percentage increase in their level of income as a result of sustainable investing technologies.

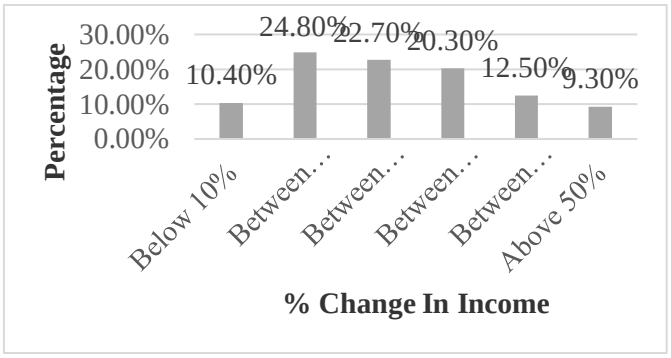

Figure 4.7 Percentage Change in Income Levels

The descriptive results on sustainable livelihoods of dairy farmers outlined in Table 4.3 show that respondents agreed with the statements their income level has increased(mean=4.35) that their income level has increased due to an increase in their production capacity(mean=4.17), that their income level has increased due to an increase in the quality of their produce(mean=4.26) and that their income level has increased as a result of expansion of their farming activities(mean=4.43). All the respondents agreed with the statements on their sustainable livelihoods as a result of sustainable investing technologies (mean=4.3, std.dev=0.164). The results bear the implications that the adoption of sustainable agricultural technologies practices enables farmers to increase their output levels which enhances their livelihoods. [5] posit that the bottom line of impact investing is helping in the reduction of the negative effects associated with business activities in the social environment.

Table 4.3: Descriptive Statistics on Sustainable Livelihoods of Dairy Farmers

Statement	Mean	Standard Deviation
Income level has increased	4.35	0.233
Production capacity has increased increasing my income levels	4.17	0.209
The quality of the produce has increased increasing my income levels	4.26	0.108
Farming has expanded increasing income levels	4.43	0.107
Average	**4.3**	**0.164**

4.5 Inferential Statistics

4.5.1 Correlation Results

The results also show that sustainable agricultural technologies and sustainable livelihood of dairy farmers in Githunguri Sub County correlate to a positive and significant level (r=0.213, sig=0.014). This implies enhancement in the levels of sustainable agricultural technologies as part of impact investing results to improved levels of sustainable livelihoods amongst dairy farmers in Githunguri Sub County. This is consistent with [7] who noted that investing in sustainable agricultural technologies ensures the existence of production continuity among farmers that raises their profit levels.

Table 4.4: Correlation Analysis

		Sustainable Agricultural Technologies	Sustainable Livelihood of Dairy Farmers
Sustainable Agricultural Technologies	Pearson Correlation	1	
	Sig. (2-tailed)		
Sustainable Livelihood of Dairy Farmers	Pearson Correlation	0.213	1
	Sig. (2-tailed)	0.014	
	N	284	284

4.5.2 Multiple Regression Analysis

A multiple regression analysis was included in the study to establish the existing relationships between the independent and dependent variables. The regression analysis was conducted at a 95% confidence level. The model summary results presented in Table 4.5 show how the independent variables relate to the dependent variable. The model further assesses the percentage of the independent variable that accounts for the dependent variable. According to the results, the R-value was found to be 0.743 implying the existence of a moderately high relationship between the independent variable and dependent variable. The R-Square value, which denotes the coefficient of determination, was 0.552 implying that 55.2% of the variation in sustainable livelihood of dairy farmers in Githunguri Sub County is attributed to an aspect of sustainable agricultural technologies practice.

Table 4.5: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.743[a]	0.552	0.496	0.947662

Predictors: (Constant), Sustainable Agricultural Technologies

The study further included the Analysis of Variance (ANOVA) model aiming at assessing the statistical significance of the model linking independent variables with the dependent variable. The level of significance is arrived at by comparing the value of F-Calculated with the value of F-Critical from the F-Statistics table at (4.279) and at 0.05 significance level. According to the results outlined in Table 4.6, the F-Calculated value was 16.9874 while the F-Critical value was 2.40. The f-calculated value is greater than the F-Critical value implying that the model is statistically significant to assess the relationship and thus can be used in the study.

Table 4.6: ANOVA (Model Significance)

	Sum of Squares	df	Mean Square	F	Sig.
Regression	229.841	4	57.46025	16.9874	0.017985[b]
Residual	943.721	279	3.3825		
Total	1173.562	283			

Dependent Variable: Sustainable Livelihood of Dairy Farmers

Predictors: (Constant), Sustainable Agricultural Technologies

The results also revealed that sustainable agricultural technologies bear a positive significant effect on the sustainable livelihoods of dairy farmers operating in Githunguri Sub County (beta=0.199, sig=0.016<0.05). The results bear the implications that when sustainable agricultural technologies are increased by one unit, the sustainable livelihoods of dairy farmers operating in the Githunguri Sub-county increase by 0.199 units. This is consistent with [7] who noted that investing in sustainable agricultural technologies ensures the existence of production continuity among farmers that raises their levels of profits.

Table 4.7: Model Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	0.443	0.126		3.5159	0.001
Sustainable Agricultural Technologies	0.199	0.186	0.145	1.0699	0.016

Dependent Variable: Sustainable Livelihood of Dairy Farmers

The optimal model of the study becomes

Sustainable Livelihood of Dairy Farmers = 0.443+ 0.199 (Sustainable Agricultural Technologies)

According to the optimal model, the sustainable livelihood of dairy farmers in Githunguri Sub County stands at 0.443 units while holding all other factors constant.

5. SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

According to descriptive statistics results, all respondents agreed with the statements about sustainable agricultural technologies and their effect on the sustainable livelihoods of dairy farmers in Githunguri Sub County. The correlation analysis results also established that sustainable agricultural technologies significantly and positively correlate with the sustainable livelihoods of dairy farmers.

Additionally, the results from the regression analysis established that sustainable agricultural technologies positively and significantly affect the sustainable livelihoods of dairy farmers in Githunguri Sub County The results of the study, therefore, imply that enhancing sustainable agricultural technologies leads to enhanced levels of sustainable livelihoods of dairy farmers operating in Githunguri Sub County.

5.2 Conclusion of the Study

From the analysis results, the study concluded that impact investing in sustainable agricultural technologies has a positive and significant effect on the sustainable livelihoods of dairy farmers in Githunguri Sub County in a way that practices in sustainable agricultural technologies increase the levels of sustainable livelihoods significantly and in the same direction.

5.3 Recommendations

5.3.1 Policy Recommendations

The study provides recommendations to the impact investing firms to enhance and improve the provision of sustainable agricultural technologies since the practice bears a positive and significant effect on the level of sustainable livelihood of dairy farmers in Githunguri Sub County. These can be achieved through practices such as the provision of advanced technologies for milking, milk storage, medication administration, and the provision of technologies that reduce the spoilage levels of milk and enhance production efficiencies.

5.3.2 Recommendations for Further Research

The context of the current study was in dairy farmers operating in Githunguri Sub County. Further research is recommended on the effect of sustainable agricultural technologies on sustainable livelihoods of other sectors of the economy such as the energy sector, livestock sector, and health sector among related non-dairy farming sectors. Further, the study established that sustainable agricultural technologies account for 55.2% of variations in the sustainable livelihood of dairy farmers in Githunguri Sub County. The study thus recommends further research on other impact investing practices not researched in the current study and that account for 44.8% as was established by the regression results. Further research is also recommended in other counties as a way of validating this study and establishing whether the findings can be replicated across all County governments in Kenya.

REFERENCES

[1] Switch Africa Green (2019). Impact Sheet. Capacity Enhancement for Green Business Development and Eco-entrepreneurship in the Agriculture Sector. Retrieved 12 February 2022, from https://www.unep.org/switchafricagreen/resources/impact-sheet/capacity-enhancement-green-business-development-and-eco-entrepreneurship

[2] Feed the Future. (2022). Evaluating the Socio-economic Impacts of Western Seed's Hybrid Maize Program in Kenya |

Feed the Future Innovation Lab for Markets, Risk and Resilience. Retrieved 11 January 2022, from https://basis.ucdavis.edu/project/evaluating-socio-economic-impacts-western-seeds-hybrid-maize-program-kenya

[3] Tegemeo Institute of Agricultural Policy & Development (2021). Report on a Study on Cost of Milk Production in Kenya. Egerton University.

[4] Zhan, J., Mirza, H., & Speller, W. (2015). The Impact of Larger Scale Agricultural Investments on Communities in South East Asia: A First Assessment. Revue Internationale De Politique De Développement, 1(6), 1-67.

[5] Cole, S., Melecky, M., Mölders, F., & Reed, T. (2020). Long-run Returns to Impact Investing in Emerging Market and Developing Economies. Retrieved 11 January 2022, from https://documents1.worldbank.org/curated/en/171981598466193496/pdf/Long-run-Returns-to-Impact-Investing-in-Emerging-Market-and-Developing-Economies.pdf

[6] Watts, N. (2017). Investing for Impact: Finance and Farming in the Southern Highlands of Tanzania (Ph.D.). University of Cambridge.

[7] Turinawe, A., Mugisha, J., & Kabirizibi, J. (2011). Socio-Economic Evaluation of Improved Forage Technologies in Smallholder Dairy Cattle Farming Systems in Uganda. Journal of Agricultural Science, 4(3).

[8] Dessart, F., Barreiro-Hurlé, J., & van Bavel, R. (2019). Behavioral factors affecting the adoption of sustainable farming practices: a policy-oriented review. European Review of Agricultural Economics, 46(3), 417-471.

[9] Janetrix, M. (2019). Determinants of Adoption of Dairy Farming Technologies by Rural Women in Kakamega County, Kenya (Masters). Kenyatta University.

[10] Olwande, j., Sikei,G & Mathenge,M.(2014) Agricultural Technology Adoption: A Panel Analysis of Smallholder Farmers' Fertilizer use in Kenya. CEGA Working Paper Series No. AfD- 0908. Center of Evaluation for Global Action. University of California, Berkeley

[11] Mugenda, O. M. and Mugenda, A. G. (2003). Research Methods: Quantitative and Qualitative Approaches, Acts Press: Nairobi.

[12] Kiambu County. (2022). County Integrated Development Plan 2018-2022. Retrieved 11 January 2022, from http://www.kiambu.go.ke/departments/images/YASC/CIDP_2018_2022.pdf

[13] Breusch, T. S., & Pagan, A. R. (1979). A simple test for heteroscedasticity and random coefficient variation. Econometrica: Journal of the econometric society, 1287-1294.

[14] Kothari, C. (2014). Research methodology. United States: Winley.

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