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# EFFECT OF COLLABORATION ON FINANCIAL PERFORMANCE OF PUSH-PULL TECHNOLOGY SMALLHOLDER FARMS IN WESTERN KENYA

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**ABSTRACT**

*Smallholder farmers in Kenya, comprising approximately 60% of the farming population, encounter various challenges that hinder their financial performance, including high input costs, limited market access, inadequate volume-to-market management, pests and weed infestation, land degradation, increased production chain losses among others. This study aimed to analyze the integration of farmers (producers) with other direct actors in the PPT value chain through collaboration, commitment, and coordination and its impact on their financial performance. The study objective is to determine the effect of smallholder PPT farmers value chain collaboration on financial performance. It was premised on the Value chain theory. A sample size of 121 PPT farmers were used. Structured questionnaires were administered to collect information on the study constructs. The study adopted a correlational research design, to allow for quantitative association and contribution of variables. Multiple linear regression and correlation analysis were used to determine the existence of significant relationship between the independent and dependent variables at alpha value of 0.05 (95% confidence level). The results established that collaboration significantly affect ROI with p values of less than 0.05. The study concludes by emphasizing the need for the development of farmer-centric policies and operational regulations in order to reduce costs and increase profits. Moreover, it encourages broader adoption of PPT and farmers' engagement in integrative farming systems as a way of making smallholder farming more profitable. By improving value chain integration, smallholder farmers can enhance their financial performance, increase agricultural productivity, reduce postharvest losses, and promote sustainable farming practices, which will increase the financial performance of the smallholder farmers.*

***Keywords**: Collaboration, Push-Pull Technology, Smallholder Farms*

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## INTRODUCTION

The agriculture sector plays a vital role in the economy of Kenya as it contributes about 24% of the GDP as well as about 75% of industrial raw materials, and 60% of export earnings(Presidency, 2018). It was the first to fully devolve the function of service provision to the county government, emphasizing the importance of the County government's role in ensuring food security (FAO, 2014). The sector employs more than 40% of the total population and more than 70% (about 4.5 million) of Kenya's rural people (Government of Kenya, 2008). This sector is of critical interest owing to its contribution as a platform for eradicating poverty by creating jobs and promoting food security in Kenya, which are two of the four pillars of the Kenyan Big Four Agenda. Maize is Kenya's most popular crop as it is Kenya's staple food, with more than 2.1 million hectors of Kenya's 5.3 million hectors of all crops harvested area between 2011 and 2013 having planted maize(Agricultura et al., 2015).Kenya has 28 million hectares of agricultural land, corresponding to 48% of the country's land area and, therefore, close to half of the country's agricultural land. There are 7.5 million smallholder farmers in Kenya, which is 80% of the total farmers, underscoring the importance of smallholder farmers in the country's economy (Sustainable Food Lab, 2016).

### Statement of the Problem

Smallholder farmers in Western Kenya adopting Push-Pull Technology (PPT) face significant financial challenges, including limited access to markets, high production costs, and inconsistent returns on investment. Despite the proven financial benefits of PPT such as reduction of input costs as it eliminates the need for fertilizer and chemicals, reduced labor cost, and increased yield, many farmers struggle to achieve financial stability and profitability. A key factor influencing their financial performance is the degree of integration within the agricultural value chain, specifically in terms of farmers and other stakeholders such as input suppliers, market agents, researchers, and policymakers. The lack of effective value chain integration results in underutilization of resources, inadequate market access, and higher transaction costs, all of which negatively impact financial performance. An integrated value chain gives farmers higher bargaining power and allows them to pool their resources to meet market needs. Available marketing and value chain management literature concentrates on formally structured systems and organizations with clear operation pathways and well-established production and marketing risk management strategies, which is not the case for smallholder farmers. Agriculture practice, being open to diverse risk factors, requires more integrated management of its value chain to eliminate or reduce risks, reduce costs, improve crop quality and quantity, enhance producers' bargaining power, and minimize losses. The available literature on value chain integration provides scattered information on the impact of value chain integration components of agro-technologies on the financial performance of small-scale farmers' performance. This study seeks to investigate how value chain integration, through enhanced collaboration influence the financial performance of smallholder farmers using PPT in Western Kenya. By identifying the financial benefits of improved integration, this research aims to provide insights for policy development and the creation of support systems that encourage broader adoption of PPT and improved economic outcomes for smallholder farmers.

### Research Hypothesis

$H_{01}$: Small-holder PPT farmers' value chain collaboration does not affect financial performance

## LITERATURE REVIEW

### Theoretical review

### Porter's Value Chain Model Theory

Michael Porter was the first to use the word value chain in his book Competitive Advantage: Creating and Sustaining Superior Performance (Porter, 1985). Potter describes the value chain as a firm's value-adding activities based on pricing strategy and cost structure. A product Value chain is a

crucial framework for understanding how a product moves from the producer to the customer. It provides an essential means to understand the business relationships, efficiency increase methods, and how to add value, as well as providing a reference point for improvements in services and the business environment (Webber, 2007). This model links smallholder farmer to the market.

Value chain analysis is the process by which the primary, secondary, and enabling activities that add value to the chain's final product are identified, and these activities are examined to reduce costs or increase gains(Grant, 2010). It also analyzes the organization's competitive strength by describing the activities within and around an organization, and how they relate. It therefore evaluates which value each particular activity adds to the organization's products or services. This idea was built upon the insight that an organization is more than a random compilation of machinery, equipment, people and money. Only if these things are arranged into systems and systematic activities will it become possible to produce something for which customers are willing to pay a price. Porter argues that the ability to perform particular activities and to manage the linkages between these activities is a source of competitive advantage(Zamora, 2016).

During value chain analysis, value chain mapping is also done whereby the critical value chain actors or players are identified so that it is clear who and how many are doing which activities, where are the given activities being done in the value chain, what are the market channels and how is the product reaching the markets (Yalamov et al., 2021).Agricultural value chains move from input suppliers, producers, aggregators, Marketers, and distributors to consumers.

Maize is Kenya's staple food, and its value chain is very complex and dynamic. The major players are input suppliers who provide inputs such as seeds, fertilizers, equipment, labor, and pesticides, among other inputs; farmers who are the producers are the next and carry out activities such as planting, weeding, and harvesting; processors who mill to produce maize meal or other by-products such as oil and animal feed; Marketers and distributors who package and sell the maize to retailers(Park, 2014). For PPT to function optimally, there has to be a primary crop(maize), a push crop (Desmodium), and a pull crop (Bracharia). The value chains of Desmodium and Bracharia mirror those of maize.

Porter's Value Chain Model can be effectively used to evaluate the financial performance of smallholder farmers by analyzing how different activities within their farming operations contribute to costs, revenues, and overall profitability. By breaking down their operations into primary and support activities, smallholder farmers can identify areas where they can enhance efficiency, reduce costs, and improve financial outcomes.

**Empirical Review**

**Value Chain Collaboration and Financial Performance**

Collaboration within a VC is described as a win-win philosophy in that resources, capabilities, and risks are shared among value chain members to achieve higher performance Vereecke & Muylle, (2005), Vieira et al., (2015) and Arshinder et al., (2009), describes collaboration as a trustful, loyal and mutual interactions between value chain actors and joint efforts towards improved performance. Collaboration materializes only when value chain members cooperate. Collaboration is conceptualized to express the extent to which resources are shared along the value chain to complement each other(Markets, 2016). Collaboration is a low-cost strategy that reduces operational wastes and redundancies to improve product and service quality.

Better collaboration between farmers and other related actors has repeatedly been identified as a key strategy for sustainable agriculture (Velten et al., 2021a). Collaboration is considered to directly and indirectly contribute to the generation of ecological, social, and economic benefits in

agricultural contexts. Collaboration is crucial for the effective management of natural resources and the coordination of farming practices. By working together, farmers can operate at scales that better align with the spatial range of ecological processes, rather than being limited to individual fields or farms. For example, when landscape features are installed collaboratively across multiple farms, it can enhance habitat connectivity and increase the overall complexity of the landscape (Gollin, 2014). In the same vein, collaboration can also support the harmonization of multiple objectives. Collaboration may result in a reduction in habitat fragmentation and better-connected ecological networks (Velten et al., 2021b; Prager, 2021; Leventon, 2017.) In terms of social outcomes, collaboration is said to increase social interaction and capital beyond the collaborative initiative itself. It thus is supposed to enhance the feeling of belonging within a community as well as the willingness of people to provide advice and mutual support (Prager, 2021). Furthermore, it has been argued that collaborative groups have greater negotiation power, can realize bigger, joint investments (Mount, 2014), and are more likely to receive funding from donor organizations than individual actors Additionally, collaboration supposedly allows for increased efficiency through minimization and sharing of costs (Fischer, 2019). It has also been suggested that collaboration facilitates the pooling and sharing of knowledge and capacities, individual and collective learning, and more legitimate, flexible, and locally relevant solutions, all of these qualities can further support the generation of social, ecological, and economic benefits.

The existing literature extensively explores various aspects of collaboration in agriculture, such as stakeholder interactions, value chain integration, and the role of technology in boosting productivity. However, there is a significant gap in the specific examination of collaboration within the context of sustainable agriculture, particularly when considering its financial implications. Although studies Hubeau et al. (2017) have delved into certain dimensions of this topic, they remain among the few exceptions that directly address how collaborative efforts can influence both sustainability and financial performance in agriculture.

This gap suggests a need for more focused research to understand how collaboration can drive not only environmental sustainability but also economic viability in agricultural practices. Exploring the financial outcomes of collaborative efforts such as cost reduction, risk-sharing, and improved access to markets and resources can offer valuable insights into the long-term viability of sustainable agricultural models. By addressing this gap, future research could contribute to a more comprehensive understanding of how collaboration can catalyze both sustainability and financial success in agriculture

## RESULTS AND ANALYSIS

**Table 1: Model summary of value chain collaboration on return of investment**

| | | | | | Change Statistics | | | |
|---|---|---|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change | F Change | df1 | Sig. F Change |
| 1 | .768[a] | .591 | .587 | .20249 | .838 | 587 | 1 | .000 |

a. Predictors: (Constant), collaboration

**Source:** Survey (2024)

**Table 2: ANOVA for collaboration on return on investment**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 7.037 | 1 | 7.037 | 171.618 | .000[b] |
| | Residual | 4.879 | 119 | .041 | | |
| | Total | 11.916 | 120 | | | |

a. **Dependent Variable:** return on investment

b. Predictors: (Constant) Collaboration

**Source:** Survey data (2024)

**Table 3: Coefficient for collaboration on return on investment**

| | | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|---|
| Model | | B | Std. Error | Beta | t | Sig. |
| 1 | (Constant) | -.269 | .065 | | -4.148 | .000 |
| | Collaboration | .227 | .017 | .768 | 13.100 | .000 |

a. Dependent Variable: return on investment

**Source:** Survey data (2024)

Based on the results, the following regression equation is derived:

$Y = -.269 + .227X_1 + e$..... Equation 1

**$R^2$ = .591 (59.1%)**

**Hypothesis Test Results**

The model summary shows a modified R-value of .768 in the Ordinary Least Squares (OLS) regression model indicating that the results were trending in the right direction (positively), based on the provided range of -1 to +1. There exists a 0.765 (76.8%) chance that the collaboration will affect the financial performance of smallholder PPT farmers in Kenya. The effect of collaboration on financial performance is 59.1%, leaving 40.9% to other factors not considered in this study. The value of R indicates how closely the actual values of the dependent variable match those forecasted values of collaboration among the value chain actors in Kenya. In the analysis of variance (ANOVA), F statistics of 171.618 is above 2 and significant at 95% confidence level where (P=0.000<0.05), this implies that collaboration has a significant effect on ROI at 95% confidence level. From this cause-effect relationship, the following analytical model is derived.

The results above show the unstandardized coefficient (0.227) suggesting that an increase of one unit in Collaboration leads to an increase of ROI by 0.227 all other factors constant. The standardized coefficient (0.768) indicates that Collaboration has a strong impact on ROI. The t-value (13.100) and the p-value (0.000) confirm that the relationship between Collaboration and ROI is statistically significant, implying that the results are not due to random chance.

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The objective of the study was to determine the effect of small-holder PPT farmers value chain collaboration on financial performance**.** The study hypothesis stated that 'Small-holder PPT farmers' value chain collaboration does not affect financial performance'

The study unearthed overwhelming evidence through data analysis supporting the fact that collaboration and return on investment have a significant association. Correlation analysis of collaboration and return on investment showed a significant correlation between each variable proving that improved relationships, teamwork, resource sharing, knowledge exchange and joint decision-making are associated with increase in ROI.

The study attests that collaboration will most certainly affect the return on investment for maize farmers. It is therefore concluded that without

improved relationships, teamwork, resource sharing, knowledge exchange and joint decision making then there will be reduced ROI. However, if all of the above are present, there will be a great positive effect on return on investment.

Fostering stronger collaboration practices is crucial. Smallholder PPT farmers should be encouraged to engage more actively with other value chain actors through workshops and joint initiatives. Strengthening these partnerships can lead to better resource sharing and improved teamwork, ultimately enhancing return on investment (ROI). Additionally, facilitating networking opportunities by organizing events and platforms for farmers to connect with stakeholders can promote the exchange of knowledge and best practices, which are essential for financial improvement.

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