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## **Socio-economic Factors Affecting Uptake of Banana Value Addition among Smallholders in Chuka Sub-county, Tharaka Nithi County, Kenya**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors JKM, GKG and MT designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. All authors read and approved the final manuscript.*

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## **ABSTRACT**

Banana farmers in most parts of Kenya have not embraced value addition despite its accrued economic benefits and emphasis by stakeholders. A study was done in Chuka Sub-County, Tharaka Nithi County to identify the socio-economic factors affecting uptake of banana value addition by farmers. The study was based on the diffusion of innovations theory to establish the relationship between farming experience, group membership, access to credit and uptake of banana value addition. The study adopted a descriptive research design whereby frequency tables were generated whilst both qualitative and quantitative data was collected. The target population was 20,180 banana farming households in Chuka Sub-County and 3 key informants. Purposive sampling, Random sampling and snowballing techniques were used to select the 156 banana farmers. A pilot study of 24 (15% of sample size) households was done in Imenti South and the questionnaire was found to be reliable (Cronbach alpha value,  $\alpha < 0.785$ ). With a 90% questionnaire return rate, the data collected was analyzed using SPSS version 25 and presented using frequency

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tables. Binary logistic regression was used to test the levels of significance of variables and the model through the Hosmer & Lemeshow test of the goodness of fit suggested that the it was good for fit to the data as  $p=0.480$  ( $>0.05$ ) while ANOVA analyses were used to check the presence of multicollinearity. It was observed that only 31.9% of farmers uptake banana value addition and there were no banana value addition technologies identified with 35.6% and 64.4% of those who uptake doing banana ripening for sale and bulk packaging respectively. The results [ $P=0.05$ ] showed that group membership [ $p=0.019$ ] and access to credit [ $p=0.004$ ] had a positive and significant effect on the uptake of banana value addition by farmers at varying levels. It was observed that farming experience had a positive effect on the uptake, but was statistically insignificant. The study recommended that; farmers should be encouraged to form cooperatives on value addition and the government and other stakeholders in conjunction with financial institutions need to streamline policies to enhance farmer's access credit for effective farming among others.

**Keywords:** *Banana; value addition technologies; uptake; group membership; credit access.*

## 1. INTRODUCTION

Banana's scientific name is *Musa Spp* and it's a tropical plant grown in approximately 130 countries globally with India ranking as first in production as it contributes 15% of the total global yield [1] and about 70 million people in Africa depend on it for their economic livelihood [2]. Most consumers use banana for food although green unripe bananas have been used for medicinal purposes in India and China. The popularity of processed banana products is growing across the world with products such as flour, wine and spirit among them. Farmers in the rural areas of America who value add their agricultural products stated that their revenues doubled through converting waste materials from agriculture produce to finished marketable products [3]. Bananas are widely and can be variedly processed into different food products, beverages [soft and alcoholic], feeds, Crafts, snacks, industrial spirits, and medicines. According to Tarrés et al. [4], socio-economic factors like lack of proper processing channels may have an impact on banana production level and in turn the rate of value addition uptake. For example, between 2002 and 2006, Costa Rica, who is not a major banana producing country, started exporting value-added banana products to thirty-eight countries in the world. As a result, out of value addition, Costa Rica generated a revenue of over 700 million dollars from the banana bi-products [5]. A study done by Kikulwe [6], if farmers uptake new technologies or value addition techniques like drying and processing their products it will not only improve the quality but also minimize post-harvest losses whilst increasing their income. Banana, which is mostly used for home consumption while the surplus being sold in markets, the best way for disposing of the banana surplus would be

through value addition, thereby addressing the growing demand for by-products from banana such as peelings which are used to make livestock feed. For example, apart from the local consumption, banana cultivated in Uganda contributes to farmers' earnings not only through sale of fresh banana fruits but also value-added products like wines, flour, cakes and chips [6].

Farmers in Kisii region uptake banana value addition for example; they started producing hypertension medicine, flour, bread, crisps, among others. This has had an economic impact on the residents. With this in mind, it is worth saying that banana farmers in Chuka can adopt value addition to enhance their economic betterment rather than to continue with the traditional banana business they have been practicing [8]. Banana value addition in Kisii is taking a stronger ground with farmers and scholars citing its positive economic impact. In Kisii a bunch of bananas will go for around Ksh 300 which has a slight difference to Chuka where it retails at Ksh 150-350 [Table 1] per bunch depending on the weight however, a group of farmers who opted to do banana crisps, the same bunch would make them up to Ksh 1,680 which is a huge difference from selling the raw bunch [7].

There is need for farmers to adopt simple value addition technologies to improve on marketability of banana. Bucheli [2] stated that undertaking a drying procedure is among the key operations that are important and extensively experienced since they involve substantial savings in transportation, storage and packaging. This is a simple process that can be adopted by farmers in Chuka Sub-County to facilitate local processing of banana with the aim of minimizing postharvest

**Table 1. Gross margins of raw and value-added banana products**

County	Price per raw bunch [Ksh]	Price per kilogram bunch [Ksh]	Returns from crisps made from a bunch [Ksh]	Price per Kilogram of Flour [Ksh]	Returns from selling a bunch of ripe bananas [Ksh]
Kisii	300	-	1,680	200-250	-
Chuka	150-350	12-15	-	-	420-500

Source: [7]

losses and the increasing selling price of banana to the farmers. Nonetheless, whereas they can recognize such difficulties as meager prices, absence of carriage and high post-harvest losses, they are often not knowledgeable to recognize possible resolutions for improving agribusiness. Gatheo [8] reported that farmers lack technical knowledge on how to handle spoilable of produce in the fruit industry. Value addition of bananas therefore can be one aspect if exploited that can help mitigate poor living standards, enhance quality of products at the market and access better paying markets.

The diffusion of technology theory has guiding factors in reasons why uptake of value addition in Chuka Sub-County is low. To begin with, Rogers [9] stated that information and how it is accessed determines the degree of absorption of which this study sought to understand if farmers ever received information and training from extension officers on banana value addition. The theory goes on to explain about the role of mass media and opinion leaders who determine if the whole society will adopt a certain technology. Therefore, when selecting the stakeholders and respondents, the research sought to determine the opinion leaders in Chuka Sub-County in order to seek their views and opinion. Also, the research sought to identify if farmers have access to media programs highlighting value addition hence the theory is relevant to this study.

Value addition will help farmers in increasing banana productivity at farm level which is driven by increased market demand of raw materials. Further, banana value addition can bring in diversification of food products whereby over reliance on crops like maize, wheat and rice can be reduced while contributing to food security. This study aimed at informing the stakeholders like the ministry of agriculture, research institutions, and the private sector organization on developing appropriate policies on value addition of bananas and the appropriate areas of training on the same in Chuka Sub-County,

Kenya. The study will assist stakeholders in agriculture and rural development to coming up with strategies that will contribute to sustainable banana production.

This study is in line with Kenya's vision 2030 which advocates for an innovative, commercially oriented modern agriculture and value addition to enhance Kenyan products to compete with the best in other markets across the globe. Also, in line with Sustainable Development Goals (SDGs) number 1 and 2 which advocates for no poverty and zero hunger; this study will contribute to increased farmers income and food security thereby achieving the global political goals of the United Nations. The findings and recommendations from this study will be of help in future for scholars who will be interested to conduct research on value addition and related fields.

## 2. METHODOLOGY

### 2.1 Study Area

Chuka Sub-County is one of the 4 sub-counties comprising Tharaka Nithi County and it lies to the East of Mt. Kenya bordering Embu East sub-county to the South, Muthambi sub-county to the North West and Igamba Ng'ombe sub-county to the East. In addition, it has a total area of 316 Km<sup>2</sup> in which 65% is arable land and 35% comprises of forest reserves, urban centers/markets and steep/rocky areas. The Sub County has a population of 83,824 persons, which comprises 40,836 males and 42,988 females. In total Chuka Sub-County have 22,423 households with a density of 1,915 persons/ km<sup>2</sup> [10]. Administratively, the district has three wards namely Karingani, Magumoni and Mugwe, 11 locations and 27 sub-locations [11].

### 2.2 Research Design

This study used descriptive research design. The design is suitable in collecting both qualitative and quantitative data and using several research

instruments [12]. The design was useful in providing in-depth information on the socio-economic and production factors affecting uptake of banana value addition in Chuka Sub-County.

## 2.3 Sample Size and Sampling Procedure

The total household population of Chuka Sub-County is estimated to be 22,423 households by 2009 Kenya census data Statistics [10], and nearly all households' practice banana farming. For the purposes of this study an approximate of 90% households in Chuka Sub-County was assumed to be practicing banana farming. Therefore, the target population of this study was 20,180 households.

A sample of banana farmers was drawn from 20,180 households using the following Slovin's formula adopted from Cochran [13]

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

Where; n= sample size, N= Population size, e= level of significance  
 $n = 20,180 \div [1 + 20,180(0.08)^2] = 156$

A sample size of 156 respondents was derived from a household population of 20,180 in Chuka Sub-County. Purposive and Random sampling technique were used to select the respondents because the purposeful sample size was large and there were no official household statistics for each ward. In addition, purposive sampling only engages respondents who are willing and can assist in providing the required information. The respondents who uptake value addition were few and scattered therefore snowballing technique was applied to ensure that, while randomly selecting the respondents both who uptake and do not uptake value addition were equally included. Key informants were selected through snowball sampling which relies on opinions from key resourceful people [12], and in this case opinion of the Sub-County Agriculture Officer Chuka on possible key informants was sought.

## 2.4 Pilot Study

This pre-testing was done to test validity and reliability of the research in Imenti South Sub-County which provided an identical environment to the study area. A total of 24 households which represents 15% of the total sample size was engaged in order to give the strengths and weaknesses of the questionnaire to allow for

improvements be made during actual data collection.

## 2.5 Validity

Validity is the degree to which the research instrument correctly measures the concepts under study and covers the intended areas [14]. Validity was done to check whether the questionnaire has covered all areas of interest by involving experts. The guidance of supervisor and other research experts was sought too.

## 2.6 Reliability

Reliability measures the degree to which a research instrument is free from errors and produces stable and consistent results [15]. This study applied the Cronbach's Alpha which requires that for the research questions to have internal consistency and be declared reliable they should generate an  $\alpha \geq 0.70$  [16]. One-time data from the pilot study were subjected to a reliability test in SPSS using the Cronbach's Alpha to prove the dependability of data collected. The four items [dependent and three independent variables] had a Cronbach Alpha value  $\alpha = 0.785$  which shows the data is reliable.

## 2.7 Data Analysis

The analysis of data was done using version 25 of SPSS altogether with the descriptive statistics. Tables were generated from SPSS and explained accordingly.

## 2.8 Binary Logistic Regression

This research used the binary logistic regression model to analyze the socio-economic and production factors influencing uptake of banana value addition. The model was especially applied due to the fact that research studies like Ntshangase et al. [17] and Ullah et al. [18] dealing with adoption of appropriate technologies for agriculture by farmers also used it. The model is more useful and appropriate for studies that are of binary nature. In this case, a farmer would either be an up taker or not an up taker of banana value addition. This study has a dependent variable represented by a farmer who uptake or not uptake (a farmer who uptakes value addition was designated 1 while the farmer who does not uptake was designated (0). The model predicts the logit of the dependent variable [uptake of banana value addition] from the independent variable[s]. The likelihood of the

farmer to uptake banana value addition was predicted by odds ( $Y=1$ ) to the probability that  $Y \neq 1$ :

$$\text{Odd } Y = \frac{P(Y=1)}{(1-P(Y=1))^\beta} \text{ This can be expanded as;}$$

$$\text{Logit}[Y] = \alpha + \{\beta_1 X_1 + \{\beta_2 X_2 + \dots + \{\beta_n X_n + e$$

Where;

$Y$  = dependent variable [Uptake] with 1 = up takers and 0 = not up takers;  $\alpha$  = intercept;  $\beta_1, \dots, \beta_n$  = coefficients of the independent variables;  $X_1, \dots, X_n$

= the independent variables;  $P[p]$  - probability of up taking banana value addition;  $1-p$  = probability that a farmer does not up take banana value addition; and  $1n$  = natural log.

With the independent variables of this model [ $X_1$  = group membership,  $X_2$  = farming experience,  $X_3$  = access to credit and so on], logistic regression for uptake in the research study is expected to take the following form:

$$\text{Logit [uptake]} = 1n [p/1-p] = \alpha + \beta_1 \text{ group membership} + \beta_2 \text{ farming exp} + \beta_3 \text{ credit acc} + \beta_4 \text{ prod} + \beta_5 \text{ farm size} + \beta_6 \text{ variety}$$

Note:

- i. If  $P$  is 0.8 for  $Y=1/x$  then the odd ratio in favor of up taking value addition is 4 compared to 0.25 of not up taking value addition given the independent variables.

### 3. RESULTS AND DISCUSSION

#### 3.1 Uptake of Banana Value Addition

In this study the defining characteristics of those who uptake banana value addition was based on earnings from value added products, processing and other simple techniques like ripening. Out of the 141 banana farmers only 31.9% were engaging in banana value addition while 68.1% of the farmers did not uptake [Table 2]. The low levels of banana value addition uptake have also been witnessed in other counties like Kiambu where only 6% of banana farmers engage in its value addition [19]. The low uptake has been witnessed in other parts of the world and in many developing countries; for instance, in Asia as Berno [20] puts it, the economic benefits of value addition have not been fully optimized and the sector is still green for many opportunities. The low optimization of the sector could have been attributed to inadequate knowhow of appropriate

value-adding technologies, poor infrastructural facilities and the absence of consistent policies that will support such ventures and initiatives in agribusiness especially in the rural areas. However, considering the effects beyond uptake and no uptake of banana value addition, checking the role that other variables play. Nwachukwu [21], concluded that farmers will not just uptake a technology or value addition technique because it is available to them; even if it is available and approved, there are some personal traits, socio-economic factors among other that may influence the decision to uptake or not to uptake value addition.

#### 3.2 Socio-economic Information about Banana Farmers

The findings of this study showed that 3.5% of farmers had engaged in banana production for the last two years or less, 9.9% have engaged in banana farming in the last 3-5 years while 86.5% of the farmers have engaged in the banana farming for more than five years [Table 3]. This outcome suggests that a majority of the farmers in Chuka Sub-County have the knowledge and experience in banana farming. Farming experience has a positive relationship to uptake of banana value addition [ $\beta=0.749$ ] although the variable is not statistically significant  $p=0.194$  at 5% [Table 6]. This was also proven by studies of Rezvanfar et al. [22] and Arellanes [23] who did not find a statistically significant relationship between uptake of value addition and farming experience. This can probably be due to the fact that farmers know how was not technologically updated. Also, a farmer may have engaged in banana farming for many years but actually lack the experience needed because they did it through a traditionally inherited practices which may not apply in this technologically advanced era with easy flow of information.

Farming experience may also require education from class and extension officers and thus given the fact that Chuka Sub-County had limited extension services and people with low levels of education, then the variable could be justified to be statistically insignificant to uptake of banana value addition. There is a 39% chance in uptake of value addition due to experience or increased number of years in farming. Usually, this is attributed to the confidence level a farmer has with the product having grown it for many years. Years of experience in the business of banana farming raises the confidence level in banana value addition uptake. Usually, those farmers

who have engaged in banana farming for many years had practical knowledge which resulted in a large-scale production system [24].

Practically, the mean number of years a farmer has been in banana farming may not necessarily be the reason banana value addition uptake is undertaken. It would be very unfair to wholly allude that the number of years a farmer has been in business causes a rise in the propensity to engage in value addition. A study done in Pakistan found no statistical significance and relationship of farming experience with uptake of new techniques and it was mainly attributed to farmers' perception about the technique [25]. However, in Chuka Sub-County the results on perception contradict the study as 71.6% of farmers perceive banana value addition to be of economic importance based on what they have heard and the simple techniques they practice [Table 4]. An attributing factor to the concern may be because most farmers are uneducated and naive to take the new technology on banana value addition [26]. Most of these farmers with low levels of education only engage in banana farming business but not in value addition. The business of banana farming faces mismanagement due to education level, which is directly proportional to the management of skills [27]. Even though a farmer may engage in banana farming for more years, they may be having limiting factors such as low-level education or lack of any formal business training [28]. Research shows that most farmers who have

been in practice for many years are from the rural areas doing subsistence farming hence low production, which does not invoke value addition [24]. Research conducted in the Philippines indicated that with many years in farming actually brought experience but people who are of age tend to be rigid in dropping traditional practices and uptake new techniques and value addition technologies [29]. Also, value addition is considered labor-intensive and risky, which makes experienced and older farmers unable to uptake or shy away from the practice [30].

Nevertheless, statistics show that farmers who have been in banana farming practice for many years have a higher chance of access to technical information on value addition than young farmers. On the other hand, age has been found to have no relationship with value addition. There is a negative effect on technological uptake with an experience level of a farmer [24]. Instead, when a farmer is educated or receiving a series of training, the likelihood of uptake of value addition is raised. For example, in Bangladesh education system in rural areas was expanded for the banana value addition to be practiced to the full extent. This step was taken to address the issue that farmers had many years of experience in banana farming but they were reluctant to uptake value addition [31]. The findings of the study showed that a higher percentage of banana farmers in the Sub-County live under low income

**Table 2. Uptake of banana value addition**

<b>Value addition</b>	<b>Frequency</b>	<b>Percent</b>
No uptake	96	68.1
Uptake	45	31.9
Total	141	100.0

**Table 3. Number of years in banana farming**

<b>Duration of banana farming</b>	<b>Frequency</b>	<b>Percent</b>
Less than 2 years	5	3.5
3-5 years	14	9.9
More than 5 years	122	86.5
Total	141	100.0

**Table 4. Importance of banana value addition**

	<b>Frequency</b>	<b>Percent</b>
No	40	28.4
Yes	101	71.6
Total	141	100.0

every month. This variable captures the income that a farmer earns from the economic activities they engage in to earn a living. It was observed that 39% earn less than Ksh 5,000 a month, 34.8% earn between Ksh 5,000 and Ksh 5,001 to Ksh 15,000, 17.7% earn between Ksh 15,001 to 30,000 and finally only 8.5% earn more than 30,000 [Table 5]. This could probably be attributed to the fact that most of them have no formal employment hence only engage in casual work and small businesses.

Value addition is heavily determined by the income or earning available to farmers. Most farmers are in the low-income category, which is the primary factor causing the inability to uptake value addition practice. Guma et al. [32] noted that worldwide, most farmers are practicing subsistence farming, which does not earn them sufficient earnings that can support value addition. Insufficient income results in low levels of value addition, which has caused a great stagnation of rural earnings. Usually, most of the low earning farmers are in rural areas, which are dominated by men, which has hindered women from engaging in income-generating activities [31]. This is also demonstrated in the findings with the highest number represented as 39% being the people in the low-income category [Table 5]. Farmer's income being a social-economic issue affecting uptake of banana value addition, has a lot of impact to value addition decisions [33]. For example, in low-income countries such as the Philippines, Uganda, and the Caribbean, among others, the majority of women engaged in some form of economic activities are either separated from their husbands or single through death or divorce [33].

Farmers in Chuka Sub-County earn between Ksh 150 and Ksh 350 per bunch or Ksh 12 to Ksh 15 per kilogram of the same bananas. The earnings are low and in Kisii County the same was noted where farmers would earn Ksh 300 for a bunch of 40-50 kilograms but after processing into crisp the same bunch would earn the farmer[s] Ksh 33 per kilogram [7]. This therefore indicated that the ridge between farmers' low income and high income lies in value addition. Indeed, opportunities exist in rural areas, but the disposable income per household is insufficient to cause banana value addition. Banana value addition is a practical reality that is achievable by diversifying income-generating activities, among other contributors [34]. On the contrary, farmer's earnings are not the real issue inhibiting banana value addition uptake. Research shows that

farmers in the category of low income have the opportunity of ensuring there are viability and economic success in value addition by pulling their resources together as a collective action [30].

Group membership was statistically significant [5%] whereby  $p=0.019$  [Table 6]. Group membership positively affects uptake of banana value addition and as per the odds ratio a farmer who belongs to a group or cooperative has a 1.917 chance to uptake value addition compared to the one who do not belong to any farming group. These findings are in line with studies by [35] which found that belonging to a farmer's group has a significant influence in the extent to which farmers participate in banana value addition. In Kenya, farmers who enroll into groups after a training is still low and this was especially observed from the cooperatives created to market horticultural produce [36]. Although there is limited literature on the operations and workability of farmer groups in the country there is need for emphasis to be put on farmers to work in groups as it enhances their capacity in terms of production, networking, mobilization of resources and quick dissemination and simulation of information.

During the study, farmers were asked whether they belong to a farmer group. The findings showed that 59.6% of the farmers do not belong to any farmers group while 40.6% belong to a group [Table 7]. The farmers during the study were not restricted to only choose banana groups but they were only to give a yes or no answer as long as it was an agriculturally related group. Through an aspect of knowledge spill over Bekele et al. [37], stated that by individuals interacting among others they end up sharing skills and knowhow either intentionally or unintentionally. Typically, when a group of farmers engages or belong to a cooperative, the tendency of value addition increases [36]. 59.6% of farmers did not belong to any cooperative [Table 6], which reduces the likelihood of engaging in value addition practice. On the other hand, 40.4% of farmers who are in cooperatives are few. Usually, the concept of value addition is a demanding activity that may require pulling together farmers' resources [38]. Even though farmers play a critical role in the production, the more significant role is represented by the cooperatives, especially in processing and marketing farmers produce. When farmers are not in a cooperative, there is a limited value



addition to banana, which reduces the net returns a farmer receives [39].

When farmers are in cooperatives, they are helped to penetrate through the market with a competitive price and best producing practices such as value addition practices, which increases their income, thus improving their social-economic status [40]. Cooperative can mobilize farmers into Savings and Credit Cooperatives Societies [SACCOs] which leads to pulling farmer's resources together, hence causing multiplier benefits due to further processing and quality and value by-products and products [41]. Failure to engage in cooperatives, farmers are unable to participate in value addition because of the inexistence of the basis of building capacity in banana product value addition [28]. Since value addition involves technology transfer, farmers who are not in cooperatives have low chance of accessing techniques such as of processing their bananas, especially in rural areas where there is the mass production of bananas. Cooperative farmers have the

advantage of technological transfer from the cooperative as a subsidy or incentive to improve the production chain [40].

Credit access was statistically significant [5%] whereby the p value=.044; accessibility to credit by farmers has a positive relationship with uptake of banana value addition and a farmer who access credit is 2.287 more likely to uptake banana value addition compared to the one who does not [Table 6]. Financial muscle is key to a new or an existing agri-business venture as it plays part in operationalizing and sustaining such. A farmer who is assured of financial support and especially one with considerate guidelines is much likely to undertake a value addition venture or uptake a technology since he has the ability to purchase the required resources to operate. Even though the issue of profitability and return on investment of the agri-business will play a critical role in up taking a value addition business, with assurance from experts the farmer may most likely decide to risk [42].

**Table 5. Total monthly farmers' earnings**

Income in Ksh	Frequency	Percent
Below 5000	55	39.0
5001-15000	49	34.8
15001-30000	25	17.7
Above 30000	12	8.5
Total	141	100.0

**Table 2. Estimates of binary logistic model**

Variables	Coefficients	SE	Df	Sig	Odds ratio	VIF	95% C.I. for odds ratio (lower)	95% C.I. for odds ratio (upper)
Group membership*	0.651	0.242	1	0.019	1.917	1.035	0.875	4.201
Credit access*	0.827	0.340	1	0.004	2.287	1.048	1.023	5.110
Farming experience	0.749	0.414	1	0.194	1.114	1.047	1.522	8.568
Constant	-3.122	0.380	1	0.000	0.044			

\*Means statistically significant at 5%

**Table 3. Membership of a farmer to a cooperative**

	Frequency	Percent
No	84	59.6
Yes	57	40.4
Total	141	100.0

Farmers were asked on whether they get access to credit facilities to assist them in agricultural production. The results showed that 53.9% of the farmers do access credit while 46.1% have never accessed credit of any form from the banking and credit facilities [Table 8]. However, these responses only show whether one acquired credit with no specifications of whether the farmer accessed for farming purpose or other businesses. In Kenya, lending institutions have mushroomed with mobile lending apps being the latest to join the market. Therefore, there is availability of credit and the issue of accessibility or no accessibility can be tied to policies guiding the lending.

Credit is widely recognized to be an effective and intermediating avenue of a way that is necessary for greater uptake of modern technologies, the subsequent increase in farm income and efficiencies [43]. These contributors of credit are value addition strategies with which farmers some have adopted, and others have failed to adapt [44]. It was observed that 53.9% of farmers can access credit in Kenyan banks [Table 8]. Likewise, Florence [45], presents research whose data shows that commercial banks have been at the forefront in lending to the agricultural sector consistently across the globe.

A study done by Martey et al. [46] attest that access to financial assistance will have a positive impact in the application of new techniques like in banana processing because a farmer will be empowered to purchase the necessary technology. However, it is still challenging to achieve value addition because the process involves an interactive procedure between different actors with diverse interests, perspectives and positions, which leads to intended and unintended results. As such, a successful value addition process has been argued to involve clear evidence that the outcomes would be beneficial to the farmer.

In a perspective put forward by Osabohien et al. [47] stated that credit may be available and accessible but still it may not achieve the purpose it was acquired for. Nevertheless, with increasing credit access, farmers can engage in value addition because the banks are on the frontline in educating farmers, especially those in rural areas, on how they can economically increase the value of their produce [48]. Evidence shows that banks have raised the

confidence level in the predicted outcomes of the usefulness of the loaned amount by training farmers on the best practices of managing their farm inputs and value addition chain. Access to credit is with numerous benefits as formal credit markets are offering supporting products for farmers who are adopting value addition [49].

Farmers were asked on the purpose of credit they obtain from financial institutions. The findings showed that out of the 78 banana farmers who took credit only 22 farmers at 15.6% used it for agricultural purposes, while 56 farmers at 39.7% used the loan for other purposes and mostly for business purposes [Table 9]. The 44.7% [67 farmers] are those who have never taken any form of credit from the financial institutions citing high collaterals required by the bank compared to a contrary of being loaned by a close friend or relative without or with low collateral [Although its availability is not always guaranteed].

This evidently shows that farmers in Chuka Sub-County may probably be not having faith in the return or profitability of the value addition of bananas. This may be attributed to low extension services to guide farmers on how to successfully venture into banana agribusiness or also farmers having a poor perception of the venture. However, as stated by the diffusion theory, a technology or innovation has stages and there are those early adopters who usually comprises of the opinion leaders and they later on help in the spread of the innovation to others [50].

Most of the farmers who have access to credit focus on loans for other most productive purposes, such as trading, operating small businesses, among others and these was also noted in Pradesh where 64% of farmers used the loan for other purposes [51]. This is the reason only 15.6% of farmers who access credit use it for farming purposes and 39.7% for those who use the loan for other purposes like expanding their personal businesses [Table 9]. However, the use of credit for these other purposes help farmers diversify their sources of income [52].

Farmers argue that to be able to use the credit for the rightful purpose successfully, they need to have at least two income-generating activities those which are non-farming activities; otherwise, they would not pay the loan as expected. This action affects the farmer's uptake to value addition [34].

**Table 4. Accessibility to credit**

Access to credit	Frequency	Percent
No	65	46.1
Yes	76	53.9
Total	141	100.0

**Table 5. Access to credit for farming**

Credit use	Frequency	Percent
No	56	39.7
Yes	22	15.6
Total	78	55.3
Missing System	63	44.7
Total	141	100.0

For example, 39.7% of farmers who have access to credit but do not use it for farming purposes, allude that investing the loans in off-farm income especially in “side hustle businesses” sources lead to a gradual livelihood improvement such as improved household assets, better food security and increased income.

Agricultural credit, for production and value addition practice, may have the capacity of enhancing income to farmers who utilize it 100%, thus defining the role of credit in the farming sector [53]. Credit access also expands the economies of scale, which increases production form and resource availability. When agricultural credit is fully used according to the intended purpose it becomes an integral part of the process which modernizes and commercializes the rural economy [31]. The rural households have been characterized with a traditional practice of consuming more of informal credit [especially from family and friends] to formal credit [54]. This may be attributed to ease of accessibility, lack of strict rules and flexibility in changing the initial intended purpose of the loan. However, such loans have low limits and lack of expertise guidance compared to formal credit and farmers need to be encouraged to seek formal credit where they will meet experts and can also be guided on how to use it based on their plans.

#### 4. CONCLUSION

The study sought to identify the socio-economic factors affecting uptake of banana value addition in Chuka Sub-County. Three factors; access to credit, farming experience and group membership were studied and the study concluded that limited access to credit and farmers not belonging to cooperative groups affected the uptake of banana value addition in

the area. Farmers’ experience was found to not have an effect on the uptake of banana value addition.

#### CONSENT

As per international standard or university standard, participant’s written consent has been collected and preserved by the author(s).

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

#### REFERENCES

1. Dhake K, Jain SK, Lakhawat SS. Value addition in green banana for rural employment; 2019.
2. Bucheli M. Bananas and business: The united fruit company in colombia. 1899-2000. NYU Press; 2005.
3. Muthee AI, Gichimu BM, Nthakanio PN. Analysis of banana production practices and constraints in Embu County, Kenya. Asian Journal of Agriculture and Rural Development. 2019;9(1):123.
4. Tarrés Q, Espinosa E, Domínguez-Robles J, Rodríguez A, Mutjé P, Delgado-Aguilar M. The suitability of banana leaf residue as raw material for the production of high lignin content micro/nano fibers: From residue to value-added products. Industrial Crops and Products. 2017;99:27-33.
5. Minten B, Tamru S, Reardon T. Post-harvest losses in rural-urban value chains: Evidence from Ethiopia. Food Policy. 2020; 101860. Available: <https://doi.org/10.1016/j.foodpol.2020.101860>

6. Kikulwe EM, Asindu M. A contingent valuation analysis for assessing the market for genetically modified planting materials among banana producing households in Uganda. *GM Crops & Food*. 2020;1-12.
7. Obaga BR, Mwaura FO. Impact of farmers' participation in banana value addition in household welfare in Kisii Central Sub-County. *International Academic Journal of Social Sciences and Education*. 2018;2(1): 25-46.
8. Gathee JW. Challenges facing the Kenyan horticultural producer for export. *International Symposium on Horticultural Economics in Developing Countries*. 1989; 270:271-278.
9. Rogers, E. *Diffusion of Innovations*. New York: Simon and Schuster, 2003.
10. Kenya National Bureau of Statistics. 2009 Kenya population and housing census volume 1 A: Population distribution by administrative units; Kenya National Bureau of Statistics. Nairobi, 2010. Available:<https://doi.org/10.4324/9781003117452>
11. Tharaka Nithi County Government (TNCG). Development of concept paper on improving the banana value chain in Tharaka Nithi County. Final Inception Report. 2018.
12. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*. 2015;42(5): 533-544.
13. Cochran, WG. *Sampling Techniques*, Wiley, New York, 1983.
14. Pallant J. *Survival manual. A step by step guide to data analysis using SPSS*; 2011.
15. Chakrabarty SN. Best split-half and maximum reliability. *IOSR Journal of Research & Method in Education*. 2013; 3(1):1-8.
16. Bolarinwa OA. Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *Igerian Postgraduate Medical Journal*. 2015;22(4):195.
17. Ntshangase NL, Muroyiwa B, Sibanda M. Farmers' perceptions and factors influencing the adoption of no-till conservation agriculture by small-scale farmers in Zashuke, KwaZulu-Natal Province. *Sustainability*. 2018;10(2):555.
18. Ullah A, Khan D, Zheng S, Ali U. Factors influencing the adoption of improved cultivars: A case of peach farmers in Pakistan. *Ciência Rural*. 2018;48(11).
19. Ntale JF, Litondo KO, Mphande OM. Indicators of value added agri-businesses on small farms in Kenya: An empirical study of Kiambu and Murang'a Counties. *Journal of Small Business and Entrepreneurship Development*. 2013; 2(3):89-101.
20. Berno T. Sustainability on a plate: Linking agriculture and food in the Fiji Islands tourism industry. *Tourism and agriculture: New geographies of consumption, production and rural restructuring*; 2011.
21. Nwachukwu JU. Technology adoption and agricultural development in Sub-Saharan Africa (SSA): A Nigerian Case Study. *Cult. Relig. Stud*. 2017;5:371-385.
22. Rezvanfar A, Samiee A, Faham E. Analysis of factors affecting adoption of sustainable soil conservation practices among wheat growers. *World Applied Sciences Journal*. 2009;6(5):644-651.
23. Arellanes P, Lee DR. The determinants of adoption of sustainable agriculture technologies: Evidence from the hillsides of Honduras; 2003. Available:<https://doi.org/10.1016/j.ecolecon.2013.11.010>
24. Pereira A, Maraschin M. Banana (*Musa* spp) from peel to pulp: Ethnopharmacology, source of bioactive compounds and its relevance for human health. *Journal of Ethnopharmacology*. 2015;160:149-163.
25. Aldosari F, Al Shunaifi MS, Ullah MA, Muddassir M, Noor MA. Farmers' perceptions regarding the use of information and communication technology (ICT) in Khyber Pakhtunkhwa, Northern Pakistan. *Journal of the Saudi Society of Agricultural Sciences*. 2019;18(2):211-217.
26. Atkins M, Agboola JO, Byrd KA, Naziri D, Pincus L, Thilsted S, Yossa R. Fish & roots, tubers and bananas in agri food systems: Opportunities for, and constraints to integrated production, Value Addition and Human Consumption; 2019.
27. Shilomboleni H, De Plaen R. Scaling up research-for-development innovations in food and agricultural systems. *Development in Practice*. 2019;29(6):723-734.
28. Pappu A, Patil V, Jain S, Mahindrakar A, Haque R, Thakur VK. Advances in

- industrial prospective of cellulosic macromolecules enriched banana biofibre resources: A review. *International Journal of Biological Macromolecules*. 2015; 79:449-458.
29. Tarrés Q, Espinosa E, Domínguez-Robles J, Rodríguez A, Mutjé P, Delgado-Aguilar M. The suitability of banana leaf residue as raw material for the production of high lignin content micro/nano fibers: From residue to value-added products. *Industrial Crops and Products*. 2017;99:27-33.
30. Sharma M, Patel SN, Sangwan RS, Singh SP. Biotransformation of banana pseudostem extract into a functional juice containing value added biomolecules of potential health benefits; 2017.
31. Sondarva YM, Desai CP, Patel JB. Constraints faced by the banana growers in adoption of innovative banana technology; 2019.
32. Guma IP, Rwashana AS, Oyo B. Food security policy analysis using system dynamics: The case of Uganda. *International Journal of Information Technologies and Systems Approach (IJITSA)*. 2018;11(1):72-90.
33. Jideani AI. Introductory chapter: Banana nutrition-function and processing kinetics. In *Banana Nutrition-Function and Processing Kinetics*. IntechOpen; 2019. Available:<https://doi.org/10.5772/intechopen.85884>
34. Hettiarachchi IC, De Silva DA, Karunaratne AS. Black and white faces of banana value chain in Sri Lanka: A case study. In *IV International Conference on Postharvest and Quality Management of Horticultural Products of Interest for Tropical Regions*. 2017;1278:185-192.
35. Sebatla C, Mugisha J, Katungi E, Kashaaru A, Kyomugisha H.(n.d.). Smallholder farmers' decision and level of participation in the potato market in Uganda. *Modern Economy*. 2014.
36. Winters JV. Human capital externalities and employment differences across metropolitan areas of the USA. *Journal of Economic Geography*. 2013;13(5):799-822. Available:<https://doi.org/10.1093/jeg/lbs046>
37. Bekele N, Obare G, Mithöfer D, Amudavi D. The impact of group based training approaches on crop yield, household income and adoption of pest management practices in the smallholder horticultural subsector of Kenya. *Journal of Sustainable Development in Africa*. 2013;15(1):117-140.
38. Tibolla H, Pelissari FM, Martins JT, Lanzoni EM, Vicente AA, Menegalli FC, Cunha RL. Banana starch nanocomposite with cellulose nanofibers isolated from banana peel by enzymatic treatment: In vitro cytotoxicity assessment. *Carbohydrate Polymers*. 2019;207:169-179.
39. Ali DA, Bowen D, Deininger K. Personality traits, technology adoption, and technical efficiency: Evidence from smallholder rice farms in Ghana. *The Journal of Development Studies*. 2020;56(7):1330-1348.
40. Paroda RS. Strategy for doubling farmers' income. *LS: International Journal of Life Sciences*. 2019;8(2):128-140.
41. Sebeko T. Assessment of postharvest loss for perishable produces from wholesalers to consumers; 2015.
42. Karienyé DK, Kamiri H. Trends of banana production among smallholders' farmers due to rainfall and temperature variations in Mount Kenya Region County, Kenya. *Budapest International Research in Exact Sciences (BirEx) Journal*. 2020;2(2):213-227.
43. Kibaara B, Nyoro JK. Expanding the agricultural finance frontier: A kenyan case no. 307-2016-4952. 2008;49-52.
44. Meijer SS, Catacutan D, Ajayi OC, Sileshi GW, Nieuwenhuis M. The role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations among smallholder farmers in Sub-Saharan Africa. *International Journal of Agricultural Sustainability*. 2015; 13(1):40-54.
45. Florence N, Nathan S. The effect of commercial banks' agricultural credit on agricultural growth in Uganda. *African Journal of Economic Review*. 2020; 8(1):162-175.
46. Martey E, Wiredu AN, Etwire PM, Kuwornu JK. The impact of credit on the technical efficiency of maize-producing households in Northern Ghana.. *Agricultural Finance Review*; 2019. Available:<https://doi.org/10.1108/afr-05-2018-0041>
47. Osabohien RO, Osabuohien E, Ekhatomobayode UE, Matthew O, Gershon O. Household access to agricultural credit and agricultural production in Nigeria: A propensity score matching

- model. South African Journal of Economic and Management Sciences. 2020;23(1): 1-11.
48. Rogers E. Diffusion of Innovations. New York: Simon and Schuster; 2003.
49. Vigneswaran C, Pavithra V, Gayathri V, Mythili K. Banana fiber: Scope and value added product developmen. Journal of Textile and Apparel, Technology and Management. 2015;9(2). Available:<http://ojs.cnr.ncsu.edu/index.php/JTATM/article/view/6825>
50. Rogers, E. Diffusion of Innovations. New York: Simon and Schuster, 2003.
51. Narain S. Agricultural credit repayment scenario among small and marginal farmers: A ground reality of Hamirpur District of Uttar Pradesh. Journal of Community Mobilization and Sustainable Development. 2019;14(1):141-146.
52. Moahid M, Maharjan KL. Factors affecting farmers' access to formal and informal credit: Evidence from Rural Afghanistan. Sustainability. 2020;12(3):1268.
53. Gebre GG, Rik E, Kijne A. Analysis of banana value chain in Ethiopia: Approaches to sustainable value chain development. Cogent Food & Agriculture. 2020;6(1):1742516.
54. Nguyen TT, Nguyen TT, Grote U. Credit and ethnic consumption inequality in the central highlands of Vietnam. Social Indicators Research. 2020;148(1): 143-172.

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