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The Potential of M-Services on improving benefits of Women vegetable Farmers- A Study on Lindi Region, Tanzania

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Abstract - In Tanzania, agriculture remains the largest sector of the economy, and hence its performance has substantial impacts on income and poverty. Vegetables are grown and consumed all in almost every meal. Some women Smallholder farmers in Lindi region in Tanzania, who uses mobile services, produces vegetables as a crop contributing to their income. The purpose of this study was to: (1) To examine the demographics of the women small holder farmers in Lindi region. (2) To analyse the difference between m-service users and non-users with regard to vegetable production. (3) To study the Effect of Determinant Factors of vegetable production

(4) To study the difference of income among vegetable producers and non-vegetable producers. The study used independent samples t-test to compare difference between vegetable production among women who avail m-services and who do not. Also the study used the regression analysis was done to find out determinant factors that brought about differences in vegetable production. further study compared difference in income between vegetable producers and non-vegetable producer. Data for this study were compiled from a quantitative survey of 99 women smallholder farmers located in 3 districts of Lindi region. Results indicate that farmers who avail m-services produce 75% more vegetables than farmers who do not avail m-services. Also the study found that there was 48 percent of increase in the income of the vegetable producing farmers. It is recommended that the government and m-service providers should encourage women smallholder farmers in terms of availability of inputs, training on improved agricultural technologies and market information on vegetables so that they can help more women smallholder farmer increase their income.

Keywords: Vegetables; Women smallholder farmers; M-services; Lindi region; Tanzania.

I. INTRODUCTION

Agriculture is the back born of Tanzania's economy. About 75% of Tanzanian human labour is engaged in agriculture. The sector contributes to 24.1% of GDP, and 65% of raw materials for local industries [1;2]. About 24% of the Tanzania's export earnings comes from agriculture [3]. In addition, nearly 87% of the rural income is originates from this sector. Food security also reflects the importance of agriculture, as over 70% of Tanzania's population relies on subsistence agriculture for food production. In the Tanzanian economy, the agricultural sector plays an important role and has the ability to advance the country's goals of economic development and poverty reduction. The performance of the Tanzanian economy as a whole has been influenced by the performance of the agricultural sector because of its large share in the country's economy [4].

The majority of the farmers are smallholder, with small pieces of land ranging between 0.2 and 2.0 Hectares [5;6]. Women are actively engaged in this sector [7]. Most grown crops in the country are Maize, Cassava, Paddy, Pulses, Beans, Sorghum, Sweet potato, Millet, Wheat, and Horticulture [8].

Most of produced crops are for subsistence, but there some crops are cash crops such as cashews, maize, cassava, sweet potatoes, bananas, sorghum, sugar cane and horticulture. Among the growing subsectors of agriculture is horticulture [9]. Horticulture is the subsector of agriculture that concentrate with the production of fruit, vegetable, and ornamental agriculture. In Tanzania women are actively engaged in horticulture. They account for 65% to 70% of the horticultural labour force [7].

In recent years, the horticulture has become one of the most competitive sub-sectors of agriculture in the country's economy. The subsector has grown much in terms of its rate and contribution to the GDP. The annual average growth of subsector is rate of 11% [10]. In fact its growth rate exceeds

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the rate of overall agriculture sector. It generates $600 millions around yearly [11]. It employs about 4.4 million Tanzanians, most of whom are women. The subsector is expecting to increase contribution to the GDP up to $3billions in three years to come.

Tanzania has huge potential of increasing horticulture production due good favourable climate. Also it has vast arable land (44 million per ha) and fertile soils from temperate to tropical at different altitudes / temperatures. Tanzania got enough water, too. Three great lakes (Victoria, Tanganyika, and Nyasa) and rivers surround it. It also has sufficient rainfall.

Horticulture has potential to attract more people since there are chances of generation of quick economic returns. The subsector also requires less land compared to other crops [10]. Despite the huge potential of the sub-sector, the employment in the horticulture agribusiness in general and vegetables in particular is less [13].

Women Smallholder farmers in Lindi region produces vegetables as a crop of choice contributing to their income. Compared with other major crops in the area, which are cashews, maize and sunflowers, vegetables are consumed in almost every meal and requires relatively small portion of land. Some of the women smallholder farmers in Lindi region, who avail m-services, grow vegetables for the purpose of improving their income. However, little was known on the difference between productivity of vegetables among m-service users and non-users with regard to vegetable production, as well as difference of income among vegetable producers and non-vegetable producers in the study area. Therefore, this study aims to: a) To examine the demographics of the women small holder farmers in Lindi region. b) To analyze the difference between m-service users and non-users with regard to vegetable production. c) To study the difference of income among vegetable producers and non-vegetable producers.

1.1. Conceptual Framework

The framework guiding this study includes factors influencing women involvement in vegetable production with a focus on m-services. The factors are categorized into two groups. The independent variables include economic factors, social factors, and environmental factors. Dependent variable is women small holder farmers involved in vegetable production.

1.2. Objectives of the Study

1. To examine the demographics of the women small holder farmers in Lindi region.

2. To analyze the difference between m-service users and non-users with regard to vegetable production.

3. To study the Effect of Determinant Factors of vegetable production

4. To study the difference of income among vegetable producers and non-vegetable producers.

1.3. Hypotheses formulated for the Study

Null hypotheses

To fulfil the above objectives the following null- hypotheses have been formulated and included in the study:

H_{01}: There is no difference between m-service users and non-users with regards to vegetable production.

$H_{02:}$ There is no difference in income between vegetable producers and non-producers

Research question

Is there difference users and non-users of m-services in vegetable production. Is there difference in income between vegetable producers and non-producers.

1.4. Scope of the Research

The scope of the study will be limited to understanding the difference between m-service users and non-users of women small holder farmers of the three districts in Tanzania-Nachingwea, Liwale and Ruangwa districts.

1.5. Research Design and Data Collection

The success of any research is solely depending on research design. Descriptive research was adopted for this study. The reason for choosing the descriptive research was that it helps in generalization to a greater extent. The study is based on both primary and secondary data. Where, Primary data is collected from a well framed and structured questionnaire to elicit the well-considered opinions of the respondents. The secondary data is collected from different Business Periodicals, Business journals, magazines, publications, reports, books, dailies, Research articles, websites, manuals and booklets.

Statistical Tools

The main tools used for statistical analysis were simple average, independent samples t-test and multiple linear regression.

1.6. Limitations of this Research

A few significant limitations of this research are highlighted below:

- Data was collected as responses to Questionnaire issued only to the farmers of Lindi region, Tanzania
- These data were used to test various hypotheses. On account of the same, the observed relationships might have been overstated in some cases and may even have been susceptible to method bias.

II. REVIEW OF LITERATURE

This section presents different studies done worldwide including Challenges facing horticulture, Studies on factors affecting production and marketing of vegetables, and Horticulture production. Others are Information and Communication Technologies and Gender inequalities.

2.1. Challenges facing horticulture

There are a range of problems facing horticulture. Among them are poor and insufficient infrastructure; tax system;

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regulatory environment; backward agricultural technology; poor linkages; and gender imbalance.

Infrastructure is widely regarded as one of the key challenges to Tanzania's horticulture sector's further growth. Both roads, railways, air transportation and electricity are poorly designed in such a way that they course difficulties for manufacturers to meet urban customers. Further, the access to international markets is limited by the reduced capacity of air freight at Tanzanian airports and by shipping costs, which are relatively higher than at other neighbour countries. Insufficient electricity increases infrastructural problems. Tanzania experiences relative high prices for electricity and regular power cut [14].

Another key challenge is the design and implementation of the tax system. Very often government agencies refuse to honour exemptions for VAT and import duties to horticulture producer, which are granted by the Ministry of Finance [15]. Further, tax and import duty incentives are assumed to be poorly executed, with duty-free imported inputs frequently held at the border, thereby hindering production and increasing costs [16].

It is very important to comply with standards and the certification of firms and products. However, it is expensive to comply with the standards. The producer is expected to have to pay $990 to ensure initial compliance before production of a food grade product [17]. Other government regulations, such as pesticide-use health and safety regulations, as well as fire and health hazards, appear to change regularly, causing confusion for producers and investors [14].

Tanzanian producers produce in a backward agricultural technology. Most of horticulture farmers in Tanzania are smallholders with poor production methods. They depend on rainfed than irrigation, which are under-developed. Consequently, productivity is very less. According to Guadagno et al., 2019, Tanzanian farmers produce an average of 6-7 tons of maize per hectare whereby producers in Zimbabwe and South Africa produces 10-11 tons of the same per hectare [14].

Productivity is also decreased by under-developed linkages with agricultural input suppliers and supporting organizations. Horticulture farms usually need close connections with nurseries, package houses, cold storage facilities and training and extension services organizations. [11]. Most nurseries in Tanzania are currently not accredited. Further, training opportunities for farmers and farm managers are still lacking , despite the need for specialized skills in areas such as pest control and post-harvest management [11].

Lack of credit, particularly long-term loans, pause challenge for horticulture companies. There are few commercial banks funding horticulture activities and they tend to place high collateral requirements and relatively high interest rates. Horticultural farmers are considered by government and donor-led programmes to be under-funded and concentrated on capacity-building activities rather than investment funding [11].

Among the challenges mentioned, gender inequality in the sector is highly significant in Tanzania [15]. According to[18], women in Tanzania made up 52 per cent of those economically engaged in agriculture [18]. Around 98 percent of rural women who are categorized as economically active are engaged in the sector. In horticulture subsector 65-70% of women are employed. However, most women are left behind in decision making.

2.2. Gender inequalities

Agriculture productivity in Tanzania is low or both men and women farmers. But there is a significantly lower productivity for women as compared to men. It is estimated that Tanzanian gender productivity gap is equal to USD 105 million per annum, which is equivalent to 0.46% of GDP. Closing this gap could save 80,000 Tanzanians out of poverty in every year [19].

Women face more challenges than men in agriculture production [20; 21] including poor access and usage of resources, low input usage, and lack of information.

There is a gap in land ownership and usage by gender, in Tanzania. According to FAO 2014 men consist of 73 percent of Tanzania's landholders are and only 27 percent of landholders are women. Moreover, women owns smaller size of pieces of land than those owned by men, whereby 93% of women's' plots have less than five acres. Or the larger plots more than 5 acres, only 11 percent are owned by women [22].

Women are more likely to use their land for subsistence agriculture than for commercial agriculture. This problem is aced by both genders, but it is more or women than for men. According to Idris, 2018 subsistence farming is practised by 89 percent of male holders and 92 percent of female holders [22].

Further, Women faces low levels of access extension services than men [23; 24; 25]. According to FAO women's productivity would have increased by 20-30% if they had the same access as men farmers have [26; 21].

Furthermore, women are more disadvantaged when it comes to accessing the advanced technologies. Thus, they participate in traditional ones which they can afford to get. These include manual and labour-intensive methods such as buckets and animals. In the contrary, due to relative economic power, men use more sophisticated and mechanized technology such as motorized pumps, sprinklers, and drip packs. It was evidenced by a qualitative study carried out in Kenya and Tanzania that men are more likely to access treadle pumps than women [27].

Also compared with women, men are often less time-constrained. The cultural norms guiding them allow men to simply get support from hire labourers which actually support irrigation [28].

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Another challenge is lack of information. Female headed households in Tanzania have 5% less access to agriculture information than male headed households [29]. Also in male headed households, women often have limits to agriculture information services usage, regardless they participate in the household farming activities [25].

Chances for adaptation of new practices and technologies are reduced by constraints the access to agricultural information by women farmers, which limits their agricultural productivity [26]. This has direct impact not only on their income, but also livelihoods and well- being of women farmers, as well as poverty reduction, and national economy [30].

2.3. Information and Communication Technologies

Information and Communication Technologies (ICTs) can help the smallholder farmer to improve production and marketing of agricultural produce through improving the quality and quantity of information available to them. Therefore, ICTs are the agents of revolution in agriculture, since they provide a number of tools that can help smallholder farmer [31].

Among the ICTs mobile phone are adopted rapidly, many citizen are able to own and used them. The rapid adaptation of mobile phone were abled by liberalization of telecommunication companies and the decrease of prices for mobile phones [32]. Therefore mobile phones have become among the tools for improving production and marketing of agricultural products that are available through mobile phone could reach smallholder farmers easily. More specifically, can help horticultural farmers to address the challenges they face. Information regarding such as disease surveillance and pest tracking for example, are practised through mobile phones [33].

2.4. Horticulture production

In East Africa there is a tendency of farmers to shift from cereal crops cultivation to horticultural due to high market price, which improves farmers' income [34]. Horticulture requires relative small land for production. Also they can be sown and harvested together with other crops on the same piece of land during the same season [35]. Women have challenge in access to land, education, and finance. Therefore shifting to horticulture farming would be suitable for them.

Production and marketing of horticulture necessitates meeting requirements such as quality and they should be within a certain period of time. Therefore, information and knowledge of the same is vital [36]. According to the World Bank, these information and knowledge can be accessed through ICT in general and mobile phone in particular or developing countries [37].

M-services

Apart from making and receiving calls, with the advancement of mobile phones, users can subscribe to mobile phone-enabled services or 'm-services' to get access of agricultural information [38] and market information [39]. M-services can be used to disseminate farmer advisory services which are special for production, also information regarding input and output markets [40].

2.5. Studies on factors affecting production and marketing of vegetables

Based on the studies, the key factors influencing the production and marketing of vegetables include the demographics characteristics of farmers, business environment, market and institutional factors.

Factors for demographics characteristics of farmers include education, experience, age and marital status. The farmer's education level represents human capital. The higher human capital levels , the more is informed decision-making, orientation and productivity. Adoption of agricultural technologies would be more successful when farmers are educated [41]. Further, educational level is said to affect market orientation and productivity. Study of [4] find that productivity and market access are much influenced by level of education of a farmer. Furthermore, education also affects the cost of information seeking and negotiating, as well as market orientation [42; 43; and 44].

The experience of vegetable farming reflects the familiarity of a farmer with the cultivation of vegetables, which is considered more complicated in vegetable than in cereals. In vegetable farming, a more experienced farmer is supposed to commercialize farming practices at a higher level. The study of [45] explains how experience is important in farmers' decision making while were choosing specific agricultural technologies for the production of chilli.

The farmer's age reflects maturity, adulthood and physical ability. In general, the effect of age on the adoption of technology is in a parabolic shape, where by the positive effects arise at certain ages and become negative after a critical point in the ageing of farmers. In studies on the adoption of agricultural chili technologies in Indonesia, farmer's age was used as an explanatory variable [45]. Age is used very frequently as a measure of farming experience. This experience simplifies some information and search costs [46].

Marital status affects agriculture. [64] suggested that under improved technologies, married household heads had slightly less area of maize than single household heads. In this study single household heads had significantly more maize area under improved technologies than married household heads.

The number of helping people determines the availability of labour for farming. Vegetable production is labour intensive in nature [47], therefore, commercial farming is expected to be assisted by a higher number of helping people. The important contribution of this variable to the adoption of agricultural technology is shown by [48].

The size of the farm reflects the scale of farming. The larger the farm size the more is the expectation in technology

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adoption. Studies of [49 & 50] showed that agricultural technology adoption is significantly affected by farm size. Farm size also leads to increase in income and status. Since intensive vegetable farming is very expensive, it is expected that farmers with a higher income will participate more than others.

The number of plots within the same piece of land reflects the household's land fragmentation. When land is divided into different pieces, intensive farming will be less productive and farmers will be discouraged. Fragmented land holdings are a huge burden on the adoption of commercial agribusiness in India [51]. In Ethiopia, [52] suggests that as it reduces commercial farming efficiency, land fragmentation should be reduced. Commercialization is defined by the kind of crops grown by farmers. Since cash-flow is the aim of commercial farming, crops that can be harvested fast will play an important role. This refers to cultivation scheduling [53].

Type of crops affects production and marketing of vegetables. There are some crops which give more return to the farmers than others. The profit could be used to invest more in farm inputs. The study of [47] showed that by shifting from rice to chilli farming, the income of Indonesian farmers doubled [47].

Access to credit helps farmers, whether wealthy or poor, to receive enough cash to fund intra-tensive commercial farming. In the commercialisation of agriculture around the world, this variable has drawn particular research interest [54; 45; 55; & 56].

Agricultural training helps farmer to increase productivity, since it enhances human capital. In Thailand, farmer's knowledge was proven to be an important factor that affecting the ability of farmer to apply good agricultural practices [57]. [58] shows that agricultural training affects the degree of acceptance of technology.

Access to market and agricultural technology information decreases asymmetric information between farmers and traders, and increases the probability of increasing the productivity of farmers. Asymmetric information, such as lack of knowledge of prevailing prices, demand and preferred quality between producers, on the one hand, and other important players in the value chain (e.g. retailers, wholesalers, consumers), have led farmers to have relatively low bargaining power [59]. In Africa, the key constraint that impedes adequate input supply in vegetable production is the lack of available technology [60].

The distance to the market illustrates the cost-effectiveness of product marketing. Vegetables are perishable, so a vital determinant of marketing performance is the distance to vegetable markets. Many studies have shown that the powerful driving force for the adoption of agricultural technology is distance from the market [55]. The closer farmers are to the markets for vegetables, the more likely they are to engage in commercial farming.

The use of mobile phones helps farmers to have access to information relating to vegetable-based farming. Farmers may perform their own business management activities with access to more complete market information. [61 & 45] have researched the impact of mobile phone use on the commercialization of agriculture, suggesting that the use of mobile phones contributes to greater prospects for the adoption of technology. Vegetable farming-related agricultural technology helps farmers to work efficiently. The higher the number of agricultural technologies used in agriculture, the more productive farming is going to be. Farmers are more likely to invest in agricultural business ventures with the availability of agricultural technology [62 & 55]. Another study by Naveed et al., 2014, found that mobile services users produced more than three times vegetables than those who didn't.

Scholars have attempted to study the trend of agricultural M-services with respect to small holder farmers. Also, some studies were specifically done to understand the contribution of M-services to income of smallholder farmers. However, those attempts have left the nuances of the women and vegetables in M-services. This study aims to fill the existing gaps. Therefore, this study throws light on the difference in productivity among M-services users and non-users, also the difference in income among the smallholder women farmers of vegetables and non-vegetable producers in Lindi region, Tanzania.

III. RESEARCH METHODOLOGY

This section consist of Profile of the study area, Statistical Tools, Research Methodology.

3.1. Profile of the study area

3.1.1. Tanzania

Tanzania is a country in East Africa that is formally called the United Republic of Tanzania. In north-eastern Tanzania, Mount Kilimanjaro is situated. In Tanzania, over 100 different languages are spoken. This nation has no official language, but Swahili is its national language. The climatic conditions of Tanzania differ gently. During the cold and hot seasons, the temperature varies between 10-20 °C. According to the 2012 census, the total population was 44,928,923. Dodoma is the capital of the central government.

Figure 1.1 District map of Tanzania

Source: https://www.google.com

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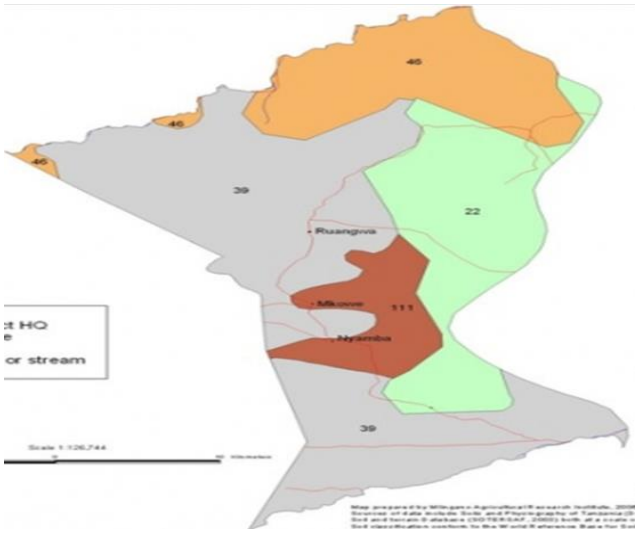
Tanzania constitutes of thirty-one regions. Regions are then subdivided into districts. Further, districts are sub-divided into wards. Furthermore wards are subdivided into streets (in cities and towns) and into villages .

3.1.2. Selected districts

3.1.2.1. Ruangwa

One of Tanzania's five districts in the Lindi region is Ruangwa. It is bordered by Liwale town to the north, Nachingwea town to the south, and the province to the west. The population of the Ruangwa District was 1,204,516, according to the National Census of Tanzania in 2002. The district boasts an abundance of minerals and immense agricultural potential. It has large deposits of graphite and uranium.

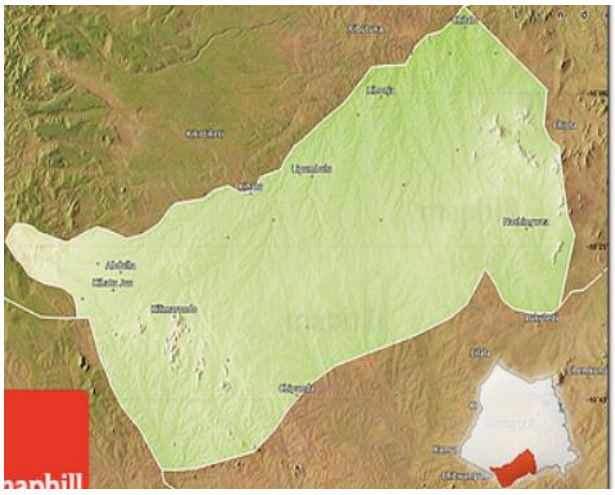


3.1.2.2. Nachingwea

Nachingwea district is situated in Southern Tanzania. It is a secret tourist area, remarkably renowned for its rich African cultures, border history and the fight for autonomy for Mozambican independence.

Figure 1.2

Map of nachingwea



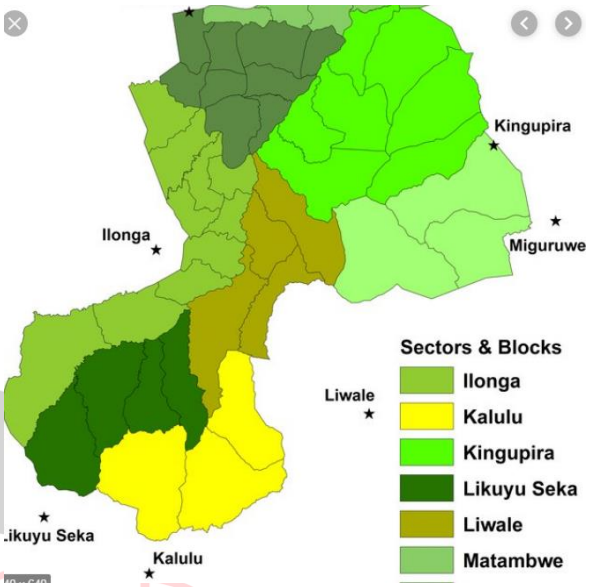
Source: www.maphill.com 1

3.1.2.3. Liwale

Because of its history and cool weather combined with active exciting places, Liwale district is a rich tourist attractive spot. The district, located in the Lindi area, is an attractive site within the Selous game reserve due to its rich ancient Maji maji wars, cultural heritage and wildlife safaris.

FIGURE 1.3

Map of Liwale



Source: www.maphill.com

3.2. Research Methodology

3.2.1. Population of the Study

All small farmers using mobile services in Tanzania are included in the population for the proposed study.

3.2.2. Research Sample

Sampling is the practice of selecting a section of the population that complies with a nominated set of criteria to be tested. It is a subset of the population that was selected to engage in the research.

In this study, because of the large number of study population and the large size of the area studied, the multi-stage sampling method was selected. The region is split into districts that are also divided into wards. Combined with the research divisions and sub-divisions, the large number of population gave convenient conditions for the application of multi-stage sampling. Multi-stage sampling is a method of sampling which uses combinations of techniques.

Lindi region was selected among 31 regions of Tanzania based on scientific reasons. The area of Lindi is split into six districts: urban Lindi, rural Lindi, Nachingwea, Liwale, Kilwa and Ruangwa. Nachingwea, Liwale and Ruangwa districts were chosen from these districts using the lottery system. The lottery method is one way of obtaining a simple random sample whereby a unique number is given to each member of the population and there is an equal chance of

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being chosen. In a bow, the numbers are carefully combined. Then, a researcher blindly selects the appropriate numbers.

10 wards were chosen from three selected districts using the lottery system. Then 10 heads of households, one from each ward, were randomly selected. A total of 100 household heads were therefore randomly selected from each district to participate in this study in order to make a total of 300 smallholder farmers. Then out of the 300 farmers only women were purposely selected. At the end 99 women were left and were engaged in the study.

3.3. Statistical Tools

Statistical tools used in this study include:

- Descriptive Analysis
- Anova
- Regression

3.3.1. Descriptive Analysis

Descriptive analyses applied in this study is simple percentage analysis. It addressed the quantity of respondents' response to a specific application in percentage of the total number calculated for the investigation.

Besides, average was used in this study. This is one of the uncomplicated single value which summarizes or describes a set of unequal values in general.

3.3.2. Independent Samples t-test

In order to assess whether there is statistical evidence that the associated population means are substantially different, the Independent Samples t-test was used in this study in order to compares the means of two independent populations.

3.3.3. Regression

For the purpose of fitting a line to the observed data, regression model was used to explain relations between variables. It helped to predict the shift of a dependent variable as the independent variable(s) changes. In this study in order, the Multiple linear regression was used in estimating the relationship between two independent variables and one dependent variable. Also the Multiple linear regression was used to measure the strength of the relationship is between two independent variables and one dependent variable.

IV. RESULTS AND DISCUSSION

This section consist of Description of women farmers visited and Differences between income of vegetable producers and non-vegetable producers. Others are Effect of Determinant Factors of vegetable production and Differences between m-service users and non-users with regard to vegetable production.

4.1 Description of women farmers visited

This section comprises the analysis of demographic profile of women smallholder farmers in Lindi region, Tanzania. It encompasses Age of respondents; Education status; and marital status.

Objective 1: To understand the demographic profile of women smallholder farmers of Lindi region

Age of respondents

Majority of the respondents (46.5%) were 41-60 years age group (Table 1). Also, respondents with less than 40 years accounted for about 41%. The proportion of respondents above 60 years group was relatively small.

Tab. 1: Age Category

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Upto 40 years	41	41.4	41.4	41.4
	41-60 Years	46	46.5	46.5	87.9
	Above 60 Years	12	12.1	12.1	100.0
	Total	99	100.0	100.0	

This result indicates that few youths, for example, primary and secondary school leavers were involved in vegetable production. Quite often, age is used as an indicator of farming experience. This experience makes certain informational and search costs easier [46].

Education status

The survey results on the educational level of respondents indicated that about 82.2% of respondents had primary education (Table 2). Also, about 4% of respondents had secondary education. The proportion of respondents with secondary education was 5%.

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Tab 2: Edualtional status of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Non	10	10.1	10.1	10.1
	1-7	82	82.8	82.8	92.9
	8-11	4	4.0	4.0	97.0
	12-13	1	1.0	1.0	98.0
	14 and above	2	2.0	2.0	100.0
	Total	99	100.0	100.0	

Educational level is said to affect market orientation and productivity. Study of [4] found that educational level influences productivity and market access. It also influences the cost of information seeking and negotiating, and hence, market orientation [42; 43 & 63]. Another study used education to explain the adoption of agricultural technologies. The educational standard of the household head reflects human capital. The higher the amount of human capital, the more informed decision-making takes place [41].

Tab 3: marital status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Married	92	92.9	92.9	92.9
	Single	4	4.0	4.0	97.0
	widow or separated	3	3.0	3.0	100.0
	Total	99	100.0	100.0	

Results on marital status showed that most of respondents (92.9%) were married while 4% were living single, and 3% widowed or separated (Table 3). Marital status is said to influence farm practices. For instance, [64] indicated that married household heads had significantly less maize area under improved technologies than single household heads.

4.2. Differences between m-service users and non-users with regard to vegetable production

The difference between users and non-users of m-services with regard to vegetable production was analyzed, using independent samples t-test.

Objective 2: To analyze the difference between m-service users and non-users with regard to vegetable production.

H_{02}: There is no difference between m-service users and non-users with regards to vegetable production.

The total sample was 99 women small holder farmer. Among the 75 were users of m-services and 24 were non-users.

Table 4: Independent Samples t-test on the Amount of Agriculture Production (in sack) between M-service Users and Non Users

	M-Service Users and Non Users	N	Mean	Std dev	t-value	Sig
Amount of Agriculture Production (in Sacks)	Yes	75	39.88	56.103	3.197	.000**
	No	24	9.83	33.348		

***denotes significant at 1% level*

The independent samples t-test result specifies that there is a significant difference at 1 percent significant level in the agricultural production among the farmers who avail m-services and who do not avail m-services. The mean difference of production is 30.05 sacks. There is 75 percent of increase in the production of the farmers who were m-service users. Hence one could conclude that the farmers who receive m-services produce more than the non-receivers of m-services.

This result support the study of Naveed et al., 2014, which found that studied on the effect of m-services on vegetable productivity. The data was farmers who used mobile phone properly produced more than three times vegetables than those who didn't.

4.3. Effect of Determinant Factors of vegetable production

Although the results from the Independent Samples t-test on the Amount of Agriculture Production between M-service Users and Non Users (table 4) shows that m-service users produces more at the mean difference of 30.05 sacks, however, this analysis

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does not show the determinant factors on which brought this difference. Therefore, the regression analysis was done, as shown in table 5 below. Also the outcome of the regression analysis was the model.

Objective 3: To study the Effect of Determinant Factors of vegetable production

The model specified for identifying the factors influencing to increase vegetable production by women farmers in Lindi region, Tanzania is as follows:

MULTIPLE LINEAR REGRESSION ANALYSIS FOR USAGE LEVEL OF MOBILE SERVICES BASED ON ITS M-SERVICES

Dependent variable : vegetable production (Y)

Independent variables : 1. Intercept (C)

2. Education status (X_1)
3. years of subscription to m-services (X_2)

Multiple R value : 0.892

R Square value : 0.795

Adjusted R Square Value : 0.785

Std. Error of the Estimate : 26.94680

F value : 79.481

p value : 0.000**

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.892[a]	.795	.785	26.94680	.795	79.481	2	41	.000

a. Predictors: (Constant), years in m-services subscription, Educational status of the respondents

The result of the regression line equation: Y= -34.557+(11.132)X1 +(35.791)X2. The coefficients values prove that there is a positive relationship between independent variables (educational status of respondents and years of subscription to m-services) and the dependent variable (vegetable production). Thus, if the education status and years of subscription to m-services increases, it will increase vegetable production. vegetable production is important for improving women farmers' income. Potentials of increasing income thorough vegetable production is higher since vegetables provide necessary vitamins and minerals throughout the lifecycle. Peoples' life style changes and are more conscious about their health. Therefore the demand of vegetables increases with the increase of change in life style as well as increase in population. Thus since the demand is there then the increase in production is vital. The increase in vegetable production by women farmers Lindi region will be realized only when they will increase educational status of respondents and years of subscription to m-services.

4.4. Differences between income of vegetable producers and non- vegetable producers

The difference between income of vegetable producers and non- vegetable producers was analyzed, using independent samples t-test.

Objective 4: To study the difference of income among vegetable producers and non-vegetable producers.

H_{02}: There is no difference in income between vegetable producers and non-producers

Table 5: Independent Samples t-test on the Income of the Farmers who Produce Vegetables and Non Vegetable products

	Vegetable Producers	N	Mean	Std dev	t-value	Sig
Income of the Farmers	Yes	44	7070454.55	4384994.47352	3.881	.000**
	No	55	3674545.45	4251501.61628		

***denotes significant at 1% level*

The independent samples t-test result indicates that there is a significant difference in the income of the vegetable producing farmers and the non-vegetable producing farmers. The mean difference of the income is 3395909.1 at 1 percent significant level. There is 48 percent of increase in the income of the vegetable producing farmers. Thus one could

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conclude that the vegetable producing farmers earn more than the non-vegetable producing farmers.

This result support the study of [47], which found that income from chilli which are vegetables, contribute more to the income of farmers that wheat. Although both potatoes and wheat had positive significant impact on household income, but chilli contribution was double the contribution from wheat.

V. CONCLUSION

This study found that vegetable production in Lindi region Tanzania benefited women smallholder farmers. This was evidenced by the high proportion of income received by vegetable producers as compared to non-producer. The mean income of vegetable producer was 4.7273, while that of non-vegetable producers was 2.9273. This implies that vegetable production increases women farmers' income. However, only about 44% of women farmers participated in vegetable production despite of the fact that nearly 75% of them are m-service subscribers. This calls for both motivation for other women to participate in vegetable production and m–service providers to put more effort in supporting women farmers in vegetable production as well as marketing. Since vegetable production directly generates income and creates employment it is high time for women smallholder farmers to concentrate in production and marketing of vegetables.

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