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Economic Analysis and Determinants of Selected Women-Led Vegetable Enterprises Performance in Koutiala and Bougouni Distircts, Mali

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Abstract
Vegetable production is one of the most important income generating activities conducted by women in Koutiala and Bougouni. This enterprise plays a fundamental role in economic development as well as improved household income and food security. Although the women have continuously produced and marketed vegetables, many households are still poor. As a result, the World Vegetable Centre introduced various interventions to improve performance of the women owned vegetable enterprises and one among many being the introduction of five new varieties of vegetables (tomato, onion, okra, eggplant and chilli). Nevertheless, empirical evidence is lacking on the benefit derived by farmers who have chosen the vegetables as well as the socio-economic and institutional factors influenicng the same. Therefore to evaluate the performance and determinants of selected women-led vegetable enterprises, gross margin analysis and ordinary least square model were used. A multi-stage sampling technique was used to obtain a sample size of 384 vegetable farmers. The study found that there was difference in the gross margins (GM) across the enterprises. All the vegetable enterprises had a positive GM and okra had the highest per meter squared (1012 fcfa, in usd 2.53) followed by tomato (1008 fcfa, in usd 2.52), onion (942 fcfa, in usd 2.35), chilli (364 fcfa, in usd 0.91) and eggplant (213 fcfa, in usd 0.53), respectively. Additionally, farm land size, access to market and group membership had a posive influence on vegetable enterprise while the number of enterprises and seed cost had a negative effect on vegetable enterprise performance. The study recommneds for creation of credit associations which can boost farmers' access to finacial empowerment which can ultimately enhance the performance of enteprises. Further, development of better infrastructure such as road and storage facilities is also needed.
Keyworks: Gross margin, Mali, Performance, Vegetable enteprise, Women-led

INTRODUCTION

Agriculture plays a crucial role in most African economies. The sector is a major source of food, income, and livelihood for more than 60% of the rural population (World Bank, 2016). Moreover, the sector contributes about 25% on average to Gross Domestic Product (GDP) in Africa. In the case of Mali, 80% of the population depends on agriculture. The sector accounted for 42% of the Country's GDP in 2012 and contributes to approximately 25% to the trade balance and provides nearly 30% of export earnings (Diakité *et al*., 2014). Besides, the sector is a source of employment to more than 60% of the labour force (UNDP, 2012). This labour force mostly comprises of women who represent between 60 and 80% of the agricultural labour force. Similarly, these women are responsible for 70-80% of the food produced in Africa (Africa Partnership Forum, 2014).

Since the sector is a major contributor to economic development of the country, the government of Mali and development partners have undertaken important agricultural development programs for livelihood improvement. A specific emphasis of these programs is on improving household income and food security through women participation in development project activities such as livestock, poultry, dairy and vegetables enterprises. These are enterprises that are of special interest to women who contribute much towards household food security. However, most of these women do not own or have access to production resources. Additionally, they receive a little share of public investment and are disadvantaged by a series of socio-cultural, regulatory and institutional factors. In term of improvement of their income women involved themselve in horticulture production especially in vegetable production.

Horticulture plays an important role in helping Mali reduce food insecurity and poverty. This is due to its high potential in creating employment opportunities for vulnerable populations as well as contributing to the achievement of food security. According to Mali's National Institute of Statistics (INSTAT, 2008), fruit and vegetable consumption was about 33kg/capita/year in 2005. Given the rapid urbanization rate (approximately 20%) and rise in incomes (approximately 20% increase in GNI/capita) from 2005 to 2014, the consumption level is expected to be higher now than it was 10 years earlier. This is because vegetables are the most affordable and

accessible sources of micronutrients. According to Akpan *et al*. (2011), vegetables are a good source of mineral salts, sugars, vitamins, and essential oils hence they increase resistance to disease. As such, their production is increasingly recognized as a catalyst for rural development and as a means of generating foreign exchange in developing countries (AVRDC, 2016).

In Mali, Sikasso region is known for vegetable production, and the enterprise is one of the most significant activities especially in Koutiala and Bougouni districts. Vegetables such as tomato, onion, eggplant okra and chili are important in terms of food production and income generation in the region. The five enterprises are the most dominant in Koutiala and Bougouni districts. These agricultural enterprises are popular with women. About 80% of the women in these districts are producing and selling vegetables. Vegetables are essential in most African diets especially tomato, onion and okra.

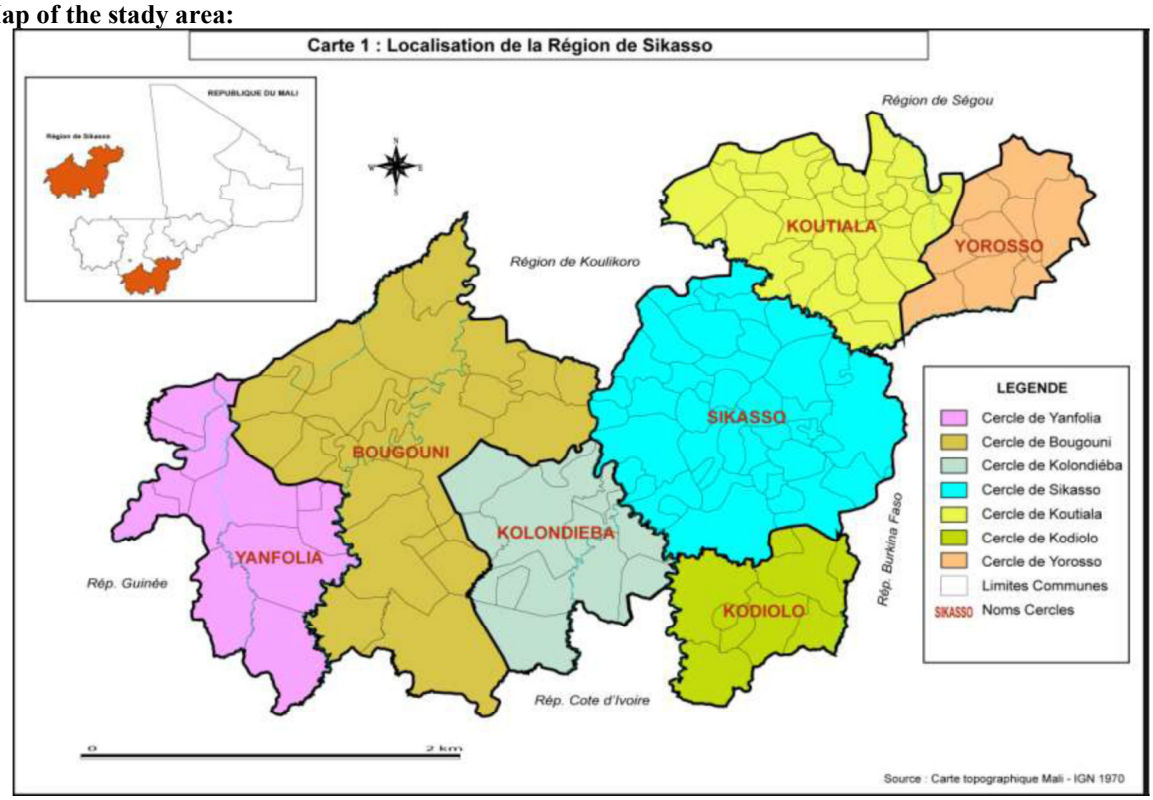
Women contribute about 26% of the agricultural GDP as compared to men whose contribution is estimated to be about 14% (Mohamed, 2013). Morevoer, agricultural productivity could increase by 20% if women's access to resources such as land, seed, fertilizer, and finances is equal to that of men. As a result, economic empowerment of women through agri-enterprises is recognized worldwide as a key driver to poverty reduction, economic growth and a way of ensuring household food security (African Development Bank, 2015). Although women have continuously produced and marketed vegetables, many households are still poor. As a result, the World Vegetable Centre introduced various interventions to improve performance of the women owned vegetable enterprises and one of them was the introduction of five new varieties of vegetables (tomato, onion, ohra, eggplant and chilli). Nonetheless, there is no empirical evidence on the benefit farmers are likely to derive if they choose the five vegetables.

Materials and Methods

Study Area

The study was conducted in Koutiala and Bougouni districts, Sikasso region, Mali. The region was favourable for this study due to the development of vegetable production. Furthermore, it is in this particular region where the World vegetable project was established with the aim to help farmers increase their production, hence it offers a unique feature in the improvement of food security. The climate is of the Sudanian tropical type, subdivided into two climatic groups: the humid Sudanian zone and the Guinean zone. It had the an avarage rainfall (700-1,500 mm / year). The average temperature is 27 °C (GoM, 2014). Koutiala district had a huma population of 575, 253 while Bougouni had 459, 509 according to the 2009 census. The main economic activities in the area are agriculture especially crop production and horticulture such cotton, millet, maize, sorghum, tomato, onion, and lettuce.

Map of the stady area:



Sampling procedure

The target population of this study were selected women-led vegetable enterprises. The study used a multi-stage sampling technique to obtain the required sample size. The first stage involved a purposive select of Sikasso region because of the development of agri-enterprises. The second stage involved purposively selecting the different villages because these villages are used by the world vegetable (Zanzoni, N'golonianasso, and Nampossela) in Koutiala, (Madina, Sibrila, and Flola) in Bougouni also the five vegetables tomato, onion, chili, eggplant and okra. Lastly 384 repondents were selected using the linear systematic sampling from different villages. Data were obtained through a semi-strucured questionnaire through face-to-face interviews. The coded data were analyzed using Stata 13 computer program.

Empirical gross margin (GM) analysis and ordinary least square (OLS)

Gross margin and OLS were used in the analysis. In analyzing vegetable enterprise performance, gross margin has been used as the unit of analysis in evaluating the economic performance of an enterprise and gave an indicator of the feasibility of an enterprise and its potential contribution to household income (Masvongo *et al*., 2013). Gross margins are usually computed per year or per cropping season (Zulu, 2011). The GMs were computed as the difference between total revenues received and total variable costs incurred.

Where by: GM= TR – TVC

TR = Q*P

TVC = Seed + Fertilizer + Pesticide + Labour + Transport + packaging

Where, GM is the gross margin

TR is Total revenue

TVC is Total variable cost

Q is the Quantity of vegetable

P is the price

Ordinary least square (OLS) model was used to determine factors affecting the performance of micro and small vegetable enterprises in Koutiala and Bougouni

$$Y_i = \beta_i + \beta X_i + \beta X_i + \beta X_i + \mu_i$$

GM = β_0 + β_1 (LZ) Land size, + β_2 (MAC) market access + β_3 (FL) family labour + β_4 (GMH) group membership + β_5 (LOE) level of education + β_6 (FC) cost of fertilizer + β_7 (SC) seed cost + β_8 (MST) marital status + β_9 (TRA) training + β_{10} (GEN) + β_{11} (EXP) experience in year + β_{12} (NOE) number of enterprise + β_{13} (EXTENS) Extension services + μ_i … (6)

The assumptions of least square method regarding linearity, normality and homoscedasticity were ensured.

Results and Discussions

Descriptive statistics

Table 1 represents the descriptive statistics of the variables used in the methodology. The administrative location had a significant and positive relationship with the different vegetable enterprises at 5% level. The results show that 43.38% of vegetable farmers in Bougouni grew tomato, 27.51% grew onions, 8.99% grew chilli, 7.93% grew eggplant and lastly, 12.16% grew okra. In Koutiala, tomato farmers were 42.56% in proportion, 39.48% for onion, 7.69% for chilli, 4.61% for eggplant and 5.64% for okra. Most of the vegetable farmers in Koutiala are engaged in tomato and onion production while those from Bougouni mainly grew chilli, okra and eggplant. This could be explained by the fact that different actors including donors such as NGOs, Agricultural development project and Malian government have promoted the growth of tomato and onion in Koutiala through agricultural projects as compared to Bougouni.

The type of occupation revealed a positive realtionship with the type of enterpises, at 5% significant level. Majority of the farmers (98.44%) ventured into crop farming as an occupation. However, 1.57% of the farmers ventured into livestock and 1.04% into off-farm businesses such as restaurants and selling of second hand clothes. Crop farming as the main occupation equips farmers with the neccsary skills and knowledge to grow the performance of an enterprise owing to the experience gained. Yamano *et al*. (2009) argued that households that have farming as their main occupation gain experience on production and marketing.

Results on marital status show that most of the respondents (94%) were married. The fact that the respondents are married suggests that couples are engaged in cooperative effort in farming activities which is a good support system for better enterprise performance. According to Moodi and Oladele (2012), a high percentage of married people, helps to assure family labour, since vegetable farming is known to be labour intensive.

Regarding the level of education, the results shows that 61% of the vegetable farmers did not go through any formal education. Illiteracy is one of the factors that acts as an empediment to agricultural development in

Mali. Low education level make farmers more vulnerable in terms of bargaining power on vegetable selling price and input price (Botlhoko and Oladele, 2013).

Table 1: Socio-economic characteristics of vegetable famers

	Enterprises						
Variables	**Tomato (165)**	**Onion (129)**	**Chilli (32)**	**Egg-plant (26)**	**Okra (32)**	**Pooled (384)**	**Chi^2**
Districts (%)							
Bougouni	49	40	53	58	72	49	11.63**
Koutiala	51	60	46	42	28	51	
Marital status (%)							
Married	94	93	97	96	97	94	
Divorce	2	2	3	4	0	2	4.7229
Widow	4	5	0	0	3	4	
Education level (%)							
None	63	56	72	53	76	62	
Primary	13	17	6	12	2	13	
Secondary	4	5	0	4	2	4	15.5847
Informal Education	5	2	0	8	4	4	
Madrasa school	15	20	22	23	16	17	
Occupation (%)							
Crop farming	98	100	90	100	100	97	
Livestock	1	0	9	0	0	2	15.7368**
Off farming business	1	0	1	0	0	1	

Institutional characteristics

Result on training in Table 3 shows a significant association between access to training and the type of vegetable enterprises undertaken by farmers. About 56.3% of vegetable farmers had access to training. Training helps farmers to incorporate the latest scientific advances and technology tools into their daily operations.Training provides information that enables farmers to be aware of new techniques of production, and helps farmers to be able to make decisions on what to produce (Masuku and Xaba, 2013).

Regarding market access, the results show that 70% of the farmers had access to the market. According to Fort and Ruben (2009), market access is an important variable in commercialization of agricultural production by farmers because it provides an avenue for farmers to access inputs, sale their output, and access information and prices status.

Outcome on group membership indicates that 75.78% of farmers belonged to a farmer group. Group membership had a positive and significant association with different enterprises the farmers opted to venture into.This could be because group members can easily organize and receive training on diverse agricultural technology issues. Shiferaw *et al*., (2006) also found that group membership gave farmers a higher market bargaining power and information about the market.

Regarding access to credit, the results show that only 37.5% of farmers had access to credit. This was due to the informal nature of their business, which makes it hard for the farmer to get credit. Access to credit facilitates introduces farmers to innovative technologies and ensures input and output marketing arrangements (Hoang, 2003). There was no significant associationbetween access to credit and the chosen enterprise by the farmers.

Table 3 : Institutional characteristics of enterprises

	Enterprises							
Variables	**Tomato (165)**	**Onion (129)**	**Chilli (32)**	**Egg-plant (26)**	**Okra (32)**	**Pooled (384)**	**Chi^2**	**P-value**
Production Training (%)								
Yes	58	47	69	73	63	56	10.620**	0.030
No	42	53	31	27	37	44		
Credit access (%)								
Yes	35	37	38	58	34	38	5.050	0.280
No	65	63	62	42	66	62		
Group membership (%)								
Yes	75	84	75	57	63	76	13.200**	0.010
No	25	16	25	43	37	24		
Market access (%)								
Yes	67	72	75	73	69	70	2.490**	0.040
No	33	28	25	27	31	30		
Extension services (%)								
Yes	74	68	68	77	81	72	12.900***	0.000
No	26	32	32	23	19	28		

Comparison of Costs, sales revenue and gross margins across enterprises

The results of the gross margin analysis of the vegetable enterprises are shown in Table 4. The results showed

that tomato was the most vegetable grown while eggplant received less attention. In terms of farm size allocated to each enterprise, the land allocated to onion producution was the highest whereas eggplant was allocated the least land size. This is probably because onion is an important vegetable in Malian meals, whether in the rural and urban regions, and regardless of the price, there is always a market for onion. Additionally the post-harvest losses for onion were lower compared to the other enterprises. All the five vegetable enterprises had a positive gross margin but okra was found to be the enterprise with the highest gross margin followed by tomato, onion, chilli and eggplant. The high gross margin of okra can be epxlained by the fact that costs of production for okra are relatively lower and the crop fetches the highest market prices during its season than most crops given its significance in Malian diets. The findings in this study on the vegetable gross margin showed that these vegetables enterprises were a viable business for farmers. The findings are similar to Masuku and Xaba (2013) who found the same in Swaziland on vegetable profitability.

Table 4: Comparison of vegetable gross margin across enterprise

	Enterprises							
Variables	**Tomato**	**Onion**	**Chili**	**Egg-plant**	**Okra**	**Pooled Data**	**F-stat**	**P-value**
Land (m^2)	68.13	83.55	58.56	34.15	66.56	70.08	6.300***	0.000
Seed cost (Fcfa per m^2)	14.07	16.54	12.85	11.11	13.19	14.52	6.800***	0.000
Fertilizer cost (Fcfa per m^2)	31.54	38.38	29.83	14.79	29.06	32.36	6.040***	0.000
Family labour (Fcfa per m^2)	18.21	12.66	24.72	10.56	30.89	17.43	18.040***	0.000
Output (kg per m^2)	6.02	5.09	1.35	1.95	3.92	5.87	1039.220***	0.000
Minimum price (Fcfa per kg)	151.09	150.04	328.28	136.54	280.00	175.26	600.440***	0.000
Sales revenue (Fcfa per m^2)	1033.33	1022.21	444.87	265.60	1101.37	934.25	11.670***	0.000
Gross margin (Fcfa per m^2)	1008.55	942.98	364.10	213.38	1012.74	879.33	9.620***	0.000

Note: For ease, land size was measured in meter square rather than usual acres or hectares due to small land sizes used in the study area

Factors influencing the performance (gross margin) of vegetable enterprises

A multiple linear regression analysis was employed to determine the factors influencing performance of vegetable enterprises. Masuku and Xaba (2013), also used orfinary least square (OLS) to identify the determinants of profitability of vegetables in Swaziland. The gross margin of the vegetable enterprises was used as the dependent variable and as the measurement of performance; whereas land size, market access, extenssion services, seed cost and number of enterprises were used as the independent variables. The respondents pointed out that some vegetables got spoiled due to lack of market and storage problem. The results in Table 5 show that out of nine independents variables, three were posively influencing enterprise performance while two were negatively influencing the performance at 1%, 5% and 10% signifinance level.

Results on land size revealed that a unit increase in land size by one meter square increases the enterprise gross margin by 0.018 unit , *ceteris paribus*. These result was statistically significant and had a positive relationship with the performance of the enterprises at 1% level. Larger land size allows farmers to grow more vegetables and diversify the farm income. The findings are in accordance with Kabwe (2012) and Bashiru (2015), who found a positive relationship between land size and farm level efficiency of smallholder farmers in Nigeria.

Farmers who had access to the market, experenced an increased gross margin of 0.038 unit. The results show that enterprises which have better market access for their products have higher probability of performing better in the business arena. In the same manner, the findings of UNECE, (2004), reveal that the decisive decision making of enterprises, good or bad performance is in the hands of market.

Access to extension services increases enterprise performance by 0.789 unit. This was due to the fact that farmers with access to extension services received trainings on best practices of vegetable production hence improve their skill on crop production (put a cititation from someone who found the same).

Seed cost reduces the gross margin of vegetable enterprise by 0.001%. Seed cost was found to have a negative and significant influence on gross margin at 5% level. The reason for the relationship could be because the type of seed used by farmers were very expensive. Thus, moreover, trainings on seed production and better-quality of seed storage may help farmers to reduce the production cost for the next season.

Results on number of vegetable enterprises shows a decrease in gross margin by 0.084%. The number of vegetable enterprises had a negative effect on gross margin and statistically significant (5%). The findings could be explained by the fact that having many enterprises requires a lot of financial support to be able to pay for more labour intensive, more inputs and intensive farm management.

Table 5 : Factors influencing the performance of vegetable enterprise

Variables	Coefficient	Std. Err.	P-value
land	0.018***	0.001	0.000
Famer occupation	-0.067	0.152	0.660
Market access	0.038*	0.019	0.077
Experience	-0.003	0.004	0.483
Level of education	0.037	0.055	0.504
Access to extension services	0.789*	0.495	0.083
Seed cost	-0.001***	0.000	0.000
Family labour	0.000	0.000	0.882
Number of enterprise	-0.084**	0.037	0.024
Constant	9.275	0.241	0.000

Note: Dependent variable is Log gross msrgin in FCFA; N= 384; R-squared = 65%; Prob > F = 0.000; ***, **,* indicate significant at, 1%, 5%, 10% level, respectively

CONCLUSION

This study looked at the performance of selected vegetable enterprise and factors influencing the performance. Farmers had low access to credit, it was renowned that all the enterprises had a positive performance and were profitable to the farmer. Okra was the most profitable while eggplant was the least. Increase in land size, investing in few enterprise, access to market and access to extension service significantly increase performance. However to enhance vegetable enterprise performance there is need to indorse credit awareness and establish credit associations which can play a major role in increasing small farmers' access to credit. As well as offer trainings on the most profitable enterprise. These diverse challenges need to be addressed so that these enterprises can grow to the next level. Therefore, there is need of formation of marketing cooperatives enables vegetable enterprise owners to market their products together to address individual small marketing output constraints

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