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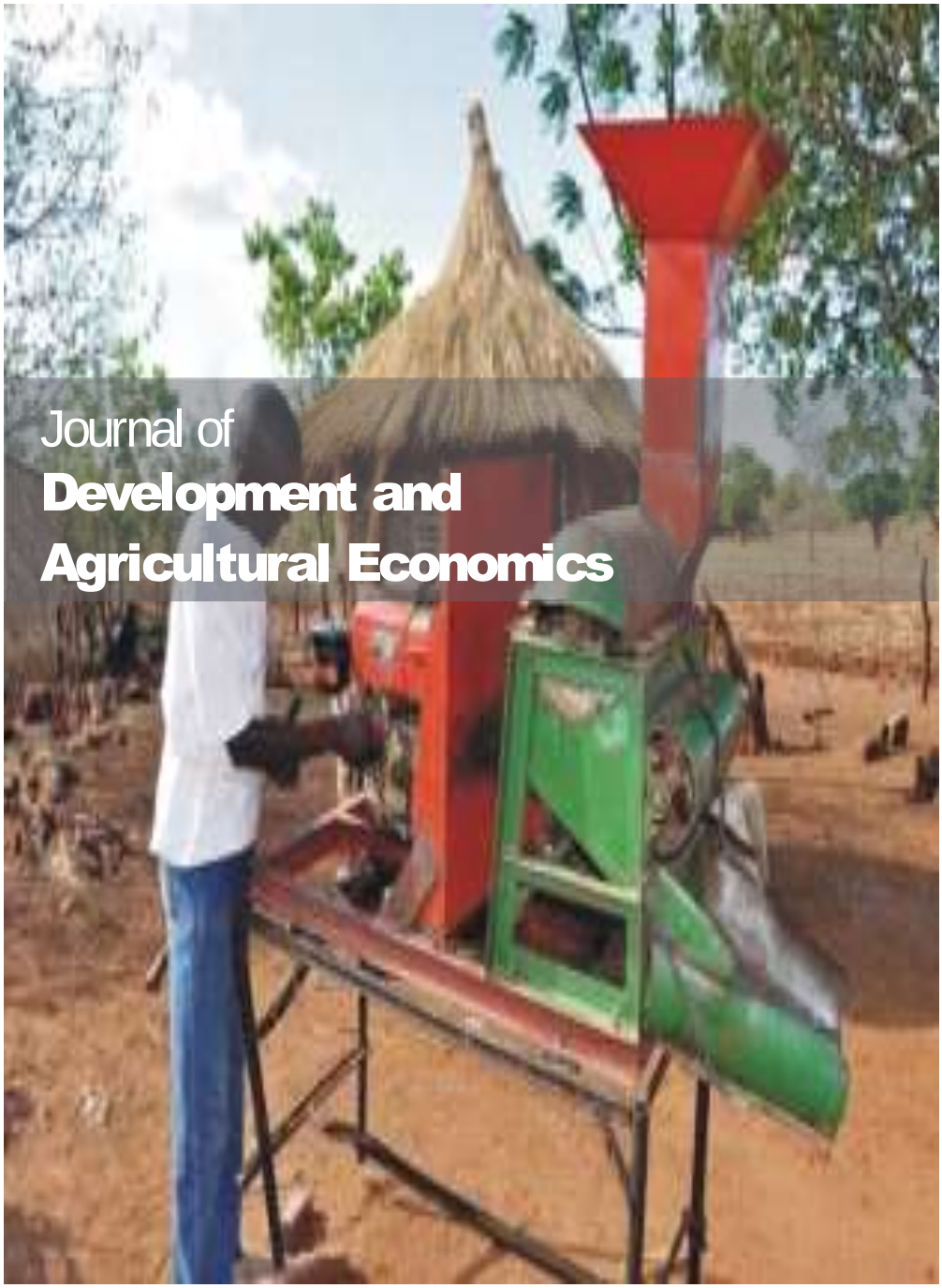

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Full Length Research Paper

Adoption of cocoa input technologies under agricultural transformation agenda among women cocoa farmers in Ile-Ife, Osun State

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Majority of women cocoa farmers in Ile-Ife are poor and are often excluded from beneficial programs and trainings that can improve their welfare. The study analyzed the effect of public agricultural transformation programme on women farmers. Specifically, the critical issue of access to, and adoption of productivity enhancing input are analyzed. Data for the analyses were drawn from women farmers in cocoa (cash crop) production in rural Nigeria. A Multistage sampling technique was used to select 70% of the women cocoa farmers (80) who were farm owners and solely responsible for farm production decision. The data were analyzed using Tobit regression technique. The results showed that marital status of respondents and perception of increased income were significant and positive at 5% while number of visits by extension workers was also positively significant at 10%. The level of education, number of children and farming experience had negative and significant impacts on adoption of ATA policy. As farming experience and the number of children of each woman increase, the level of adoption of ATA program would decrease. The study concludes that most women farmers lack relevant information on the benefits and targets of public agricultural development programme. This greatly limits their ability to participate and benefit from such. There is a need to review the public agricultural information transmission channel.

Key words: Women, cocoa, adoption, agricultural transformation agenda.

INTRODUCTION

The Federal Government of Nigeria instituted National Economic Transformation program as a means to diversify Nigerian economy from oil. In line with this, the Federal Ministry of Agriculture and Rural Development implemented an Agricultural Transformation Agenda (ATA) in that will promote agribusiness, attract private sector investment in agriculture, reduce post-harvest losses, add value to local agricultural produce, develop rural infrastructure and enhance access of farmers to financial services and markets. The ATA sets out to create over 3.5 million jobs along the value chains of the priority crops of rice, sorghum, cassava, horticulture,

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cotton, cocoa, oil palm, livestock, fisheries, etc. for Nigeria's teeming youths and women, in particular. Agricultural Transformation Agenda (ATA) started in countries like China, Vietnam, Brazil and Thailand. This brought about a drastic growth in their agricultural sectors and reduced unemployment rate. In Nigeria, this policy was initiated in 2011 to achieve a hunger-free country through an agricultural sector that drives income growth and transforms Nigeria into a leading country in global food markets. Cocoa is a major agricultural export of Nigeria; in 2013/2014 Nigeria produced an estimated 230,000 tons of beans (ICCO, 2014) and this is largely produced by smallholder farmers. On the whole, the average output per farmer is less than 300 kg per hectare of cocoa (Nwachukwu et al., 2010). Cocoa is one of the capital intensive businesses especially when it comes to the purchase of improved seedlings. This becomes more challenging to women who usually have no or limited fund for investment. Women make crucial contributions in agriculture and rural enterprises in all developing country regions, as farmers, workers and entrepreneurs. In sub-Saharan Africa women have relatively high overall labour-force participation rates and the highest average agricultural labour-force participation rates in the world (FAO, 2011). Women farmers are central to the sustainability of the cocoa supply chain and cocoa-growing communities. Although they are often overlooked and unrecognized, women farmers and laborers make a significant contributions to the amount of cocoa produced, which is under increasing demand (Marston, 2016).

Despite the important roles of women in cocoa business in Nigeria, they are saddled with most of the tasks in cocoa production 'supposedly' meant for the man while their returns to labour are not commensurate to the man-hours spent on the task. Majority of them are hardly given any attention in the area of training and/or visitation by extension agents with improved technologies. Banks do not grant them loans because of lack of ownership over assets and they are hardly reached with improved seedlings, fertilizer and other inputs (FAO, 2011; SAHEL, 2014; OXFAM, 2013). These conditions have entrenched the women in a vicious cycle of poverty that places them at a less advantageous vantage of income and resource empowerment.

Women farmers face daily struggle with gender inequality in cocoa market. Women are often hired for lower paying work while men do more wage rewarding works. Over the years, traditional institutions have been involved in policy formation involving only men in the exercise. They are seldom involved in key decision roles (UN, 2011; Adeniyi, 2010). According to Kofi (2003), when women are fully involved in decision making, families are healthier, better fed, with increased family incomes, improved savings while re-investment increases. In order to tackle the issues in Nigeria, certain strategies have been put in place by the Federal Government and research institutes. Nigerian Cocoa Research Institute (NCRI) had released eight new cocoa hybrids through ATA giving out 1.4 million cocoa pods to farmers in cocoa producing states in the country. Also, provision of inputs such as fertilizers, insecticides and fungicides at a subsidized rate was also included. It is believed that if women in cocoa producing areas of Osun state adopt the use of cocoa improved seedling, outputs from cocoa will increase thereby improving the benefits the women derive from cocoa business. This will attract more men and women into the business especially the youths thereby increasing the revenue Nigeria derives from cocoa production

MATERIALS AND METHODS

The study was carried out in Osun State of Nigeria. A multistage random sampling technique was employed in data collection. The first stage involved the purposive selection of two Local Government Areas (LGAs) noted for cocoa production. In the second stage, purposive sampling technique was used to select 5 villages per LGA prominent in cocoa production was done. In the third stage, proportional and snow ball sampling technique was used to select 5-10 respondents per village to make a total of 80 respondents. Data were collected with the use of questionnaire on 2013/2014 cropping season including the socio-economic characteristics of the respondents such as age of the farmer, sex, marital status, farm size, household size etc. level of awareness of Agricultural Transformation Agenda of improved cocoa seedlings among women cocoa farmers, extension visit, neighborhood effect and the level of adoption of ATA policy. Descriptive statistics was used to describe the socio-economic characteristics of the respondents, level of awareness of ATA and the level of adoption in the program. Tobit regression model was employed to analyze factors that affect adoption of improved cocoa seedlings among women cocoa farmer in the study area.

Tobit model

In a Probit model the variable of theoretical interest, y*, is unobserved; what is observed is a dummy variable, y, which takes on a value of 1 if yi* is greater than 0, and 0 if otherwise. In contrast, Splett et al. [1994] devised what became known as the Tobit (Tobin's probit) or censored normal regression model for situations in which y is observed for values greater than 0 but is not observed (that is censored) for values of zero or less. The standard Tobit model is defined as,

$Y_i^* = x_i\beta + \varepsilon i$
$Y_i = Y_i^*$ if $Y_i > 0$
$Y_i = 0$ if $Y_i \leq 0$

where yi* is the latent dependent variable, yi is the observed dependent variable, xi is the vector of the independent variables, β is the vector of coefficients, and the εis are assumed to be independently normally distributed: $\varepsilon i \sim N(0, \sigma 2)$ (and therefore yi ~ N (xiβ , σ2)).

Tobit model is explicitly expressed as: $Y=\beta_0\phi + \beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4 X_{4.....}\beta_{17}X_{17} + U_x$

Y= level of adoption (0….1)
$\beta_{0=}$ constant, β= coefficient, $X_1,X_2,X_3…..X_n$ = explanatory variable,

Table 1. Result on socio-economic characteristics of cocoa women farmers in Ile-Ife.

Variable	Mean/mode	Percentage
Age	45	45
Marital Status	Married	67
Educational Level	Secondary Education	45
Number of Children	4	33
Level of Income	Personal Savings?	98

Source: Data analysis, 2015.

Table 2. Result of the awareness of ATA improved cocoa seedlings among cocoa women farmers in Ile-Ife.

Variable	Awareness	Percentage
Information on ATA	Yes	88
Year of awareness	2012 (A year after ATA started in Nigeria)	38
Awareness of input distribution	Yes	88
Awareness of hybrid Pods	Yes	88
Awareness of rehabilitation supports	Yes	81
Awareness of Cocoa Quality	Yes	78

Source: Data analysis, 2015.

$U_{i=}$ error term,

The explanatory variables are:

$X_{1=}$ age (years), $X_{2=}$ Gender, $X_{3=}$ Level of education (years), $X_{4=}$ Farming experience (years), X_5 = Household size (numbers), X_6= Yield (tonnes/hectare), X_7= Credit facility (₦), X_8= Extension services (number of visits), X_9= Awareness of ATA program, X_{10}= Neighborhood effect, X_{11} =Input availability from ATA, X_{12}= Source of credit facility, X_{13}= Distance from farm to the market (km), X_{14} = Transportation cost, X_{15} = Farmer's willingness to participate in ATA, X_{16}= Farmer's perception of improved income, X_{17}=Selling point.

RESULTS AND DISSCUSSION

Result of socio-economic characteristics

Table 1 present the socio-economic result of the cocoa farmers in Ile-Ife. The result shows that about half of the women are still agile and majority of them were married with average of secondary school education. This suggests that assessing useful information will not be difficult for these women provided their domestic duties permit them. About one-third of them have an average of 4 children and are running the cocoa business with personal savings. This explains one of the reasons why majority of the women are into cocoa business on a small scale. This established the findings of Koyenikun and Emede (2011) where increased awareness of programs among respondents did not produce corresponding adoption rate.

Result of the awareness of ATA program among cocoa women farmers in Ile-Ife

The result (Table 2) shows that majority of the women had information about the cocoa input technologies under ATA and were well informed about the various inputs and benefits of participating in ATA as early as a year after the program started. This suggests that the level of awareness is not poor among women cocoa farmers in Ile-Ife.

Result of assessment of the level of adoption of ATA among women cocoa farmers in Ile-Ife

Findings from this assessment (Table 3) revealed that majority of the women had a good perception of the agenda and were willing to adopt it. However, majority (71%) of the women did not register with the LGAs to participate in the agenda. Possible explanation to this could be because of poor extension visits to demonstrate the technologies to the women which might be the reason for the poor level of adoption (4%) of the agenda among women cocoa farmers in the study area.

Results of the factors that determine adoption of ATA among women cocoa farmers

From Table 4, age, marital status, credit facility, extension services, awareness of ATA/ neighbourhood effect had positive effects on level of adoption while education,

Table 3. Result of assessment of the level of adoption of improved cocoa seedlings under ATA.

Variable	Mean	Percentage
Registration with LGA office	No	71
Perception about ATA	Good	73
Extension visit for neighbourhood demonstration	No	69
Willingness to adopt ATA	Yes	84
Number of women that adopted cocoa input technologies under ATA	Yes	4

Source: Data analysis, 2015.

Table 4. Tobit regression result.

Adoptata	Coefficient	Std. Err	. t	P>|t|
Farmers age	0.0022007*	0	0.64	0.526
Marital status	0.1922973**	0.0723923	2.66	0.010
Gender	-0.0861117	0.0681914	-1.26	0.211
Level of education	-0.0212944*	0.0344593	-0.62	0.539
No of children	-0.0080003*	0.020634	-0.39	0.699
Farming experience	-0.0107621**	0.0041325	-2.60	0.011
Assess to credit facility	0.2450408	0.0716042	3.42	0.001
Extension agents	0.1591418***	0.0528423	3.01	0.004
Awareness of ATA	0.0265184	0.0735663	0.36	0.720
Neighbourhood adoption	-0.1819562	0.0517394	-3.52	0.001
Willingness in ATA	-0.0010705	0.1040892	-0.01	0.992
Perception abt ATA |	0.1422138**	0.0539467	2.64	0.010
Yield/Ton	0.164119	0.193704	0.85	0.400
Means of obtaining fund	-0.1564538	0.1162929	-1.35	0.183
_constant	1.284034	0.3583402	3.58	0.001
/sigma	.1835336	0.0146885		

Source : Data analysis, 2015.
Note: ***=1% level of significance, **= 5% level of significance, *= 10% level of significance.

number of children depending on the level of income and farming experience affected level of adoption negatively. Age of women cocoa farmers in the study area has a positive and significance relationship with adoption of cocoa technology. This shows that if the age of the women farmers increases, there is going to be an increase in the level of adoption of ATA. This implies that as women cocoa farmers grow older the level of adoption of cocoa input technologies under ATA increases. Marital status of the respondent is also positive and had a significant relationship with adoption of cocoa seedlings technology. This indicates that if there is an increase in marital status of the respondents the level of adoption of ATA will increase. This implies that as women cocoa farmers transit from being single to a married life, the level of adoption improves.

Perception of women cocoa farmer of improved income is also positive and significant which indicates an increase in the conscious understanding that ATA policy will increase income of women cocoa farmers will make the adoption of cocoa input technologies under ATA to increase. From this result, the number of visit of extension agent to the respondents was positive and significant as presented in Table 4. This explains that the level of adoption of ATA will increase with an improvement in the extension services offered to these adopters in the study area which could be in the form of increased frequency of visits and etc. Farming experience is also negatively significant at 5% level with a coefficient of 0.011 implying that the more or the higher the level of experience of respondents, the less or lower the level of adoption of cocoa improved seedlings under ATA.

Conclusion

Age, marital status, credit facility, farming experience, level of education, awareness about ATA/ neighbourhood effect, people depending on income and visit by

extension agents were factors affecting the level of adoption of cocoa input technologies under ATA among women cocoa farmers. Farmers that are married and have a good understanding or perception that ATA would increase their level of income would tend to adopt the agenda more. Increase in the number of visit of the extension agent to the respondents, to advice or sensitize them on the benefits of ATA would increase the level of adoption. The higher the level of education and farming experience, the lower the level of adoption of the respondents which may be due to the past experience with past government programs or failure of past government policies.

RECOMMENDATION

The number of visits of extension agent to the study area should be increased and awareness about cocoa input technologies under ATA should be intensified among women cocoa farmers in the study area. Credit facility should also be made available to the farmers.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Viable alternatives to cotton-wheat crop rotation for semi-arid climatic conditions

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A study was conducted in the research area of Agronomy Department, University of Agriculture, Faisalabad during 2014-2015 to evaluate a sustainable and economical wheat-based rotation system under agro-climatic conditions of Faisalabad, Pakistan. Guar, maize, mash bean, mung bean, soybean, millet and some fodders (maize, millet and sorghum) were grown in Kharif season while wheat was the main crop in Rabi season. Wheat-fodder millet-grain maize gave the highest net benefits of Rs. 272062 ha^{-1} but exhausted the soil. The maximum value of BCR (2.25:1) was achieved in the same rotation that is, wheat-fodder millet-grain maize followed by wheat-fodder maize-mash bean with BCR of 1.86:1. Keeping in view the soil fertility plus economy, the wheat-fodder maize-mash bean cropping system is not only economical for small landholders but also improve soil fertility status as compare to others.

Key words: Crop rotations, cropping patterns, economics, semi-arid and subtropical climate.

INTRODUCTION

Farmers generally follow the conventional and nutrient-exhaustive cropping systems that show a negative trend in crop efficiency. These may include rice-wheat, cotton-wheat and mixed-wheat. The traditional mixed cropping system has failed to provide its financial potential in kharif/summer season (Rasul and Mahmood, 2009). In cotton-wheat system, cotton is planted in summer and is followed by winter wheat. Cotton occupies a large area of land because it is considered as more profitable crop than wheat. Many efforts have been made to assist the farmers in making thoughtful management choices to stay sustainable in continuously changing climatic conditions in agriculture, but, the best tactic is always a dynamic cropping system approach (Tanaka et al., 2002). Many cropping patterns implemented by the growers are generally exhaustive and non-productive that not merely leads towards lower revenues but cause continuous drop in the soil productivity too. The cropping systems in areas with limited precipitation are subjected to a wide range of variations in production and profitability (Sharma et al., 2007). In dry land cropping systems, we can effectively enhance cropping frequency using guidelines for selection of crops (Nielsen et al., 2010). The inclusion of crops such as oilseeds, legumes, fodders and pulses can

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enhance the soil fertility and productivity of cereals (Ahmad et al., 2001; Reddy and Suresh, 2009). The significant changes in cropping systems may be induced due to the relative prices rather than productivity (Vivekananda and Satyapriya, 1994; Vyas, 1996). Present cropping system has become obsolete and local farmers gain minor returns from it. The need of the hour is a revised set of cropping system comprising on advanced and systematic practices of agriculture which will necessarily be cost-effective, feasible, sustainable and suitable to growers in that region (Gill and Ahlawat, 2006). A cropping system having such qualities is anticipated to enhance the farm productivity with regards to improved farm production, higher water use efficiency and improved utilization of farm labor, farm machinery and all other available resources (Dogan et al., 2008; Ghosh, 1987). The current research plan was intended to discover economically effective cropping systems in semi-arid climatic conditions of Faisalabad region on sustainable basis concerning the fertility status of the soil. In other words, the current study was planned to propose some feasible alternative crops as a substitute of cotton during kharif/summer season to attain highest agronomic efficiency on sustainable basis from the existing resources.

MATERIALS AND METHODS

This study was conducted on sandy clay loam soil at Agronomic Research Area, University of Agriculture, Faisalabad, Pakistan under prevailing semi-arid climatic conditions of this sub-tropical area during 2014-2015. The experimental area was located at 73° East longitude, 31° North latitude and at an altitude of 135 m above sea level. Soil of experimental area was quite uniform, so a composite and representative soil sample to a depth of 30 cm was obtained with soil auger, before sowing the crops and after the final harvesting. The experiment was laid out with a net plot size of 9.5 m × 6 m in randomized complete block design (RCBD) having four replications. The following crop rotations were tested during the study: T_1= cotton-wheat, T_2= wheat-guar, T_3= wheat-fodder maize-mashbean, T_4= wheat-fodder sorghum-mungbean, T_5= wheat-fodder maize-soybean, T_6= wheat-fodder millet-grain maize, T_7= wheat-mashbean-soybean, T_8= wheat-mungbean-grain millet. Cultivars/Varieties used during this experiment was Wheat (Lasani-2006), Cotton (FH-142), Mungbean (AZRI mung-2006), Mashbean (Mash Arooj), Guar (BR-99), Soybean (PSC-60), Sorghum fodder+grain (Sandal Bar Sorghum), Millet fodder (FB-786), Millet grain (HP-50), Maize fodder (Sadaf) and Maize grain (DK-6789 Hybrid). Wheat crop was sown after the harvesting of kharif and other summer crops in various combinations of rotations. Recommended doses of N-P-K fertilizers and all cultural practices were done for each crop according to the recommendations by Punjab Agriculture Department. Crops were harvested at maturity for grain purpose. However, the cutting of fodder crops was done on recommended time to get good quality forage. Soil chemical analysis was done before and after conducting the experiment to record the following chemical characteristics: Organic matter (%), Total nitrogen (%), available Potassium (ppm) and available phosphorus (ppm) using standard methods (Homer and Pratt, 1961). Following crop growth parameters was taken for all the crops: Total dry matter production (kg ha^{-1}), 1000-grain weight (g) and grain yield (t ha^{-1}). The mean economical values were calculated for each rotation using the mean market prices of the produces while marginal analysis, dominance analysis and marginal rate of return were calculated using methodology described in CIMMYT training manual (Cimmyt, 1988). Treatment means were compared using Tukey's honest significance difference (HSD) procedure (TUKEY, 1953).

RESULTS AND DISCUSSION

Total dry matter

Data showed significant effect of wheat based cropping rotations on the total dry matter of wheat crop. The maximum (14893.50 kg ha^{-1}) total dry matter of wheat was observed in wheat - mashbean - soybean cropping system followed by wheat - guar cropping system (14214.03 kg ha^{-1}). The cropping system viz. wheat - fodder maize-mashbean, wheat - fodder sorghum-mungbean, wheat-fodder maize-soybean and wheat-mungbean-grain millet produced 13661.43, 13631.21, 13607.68 and 13534.56 kg ha^{-1} wheat dry matter and these were statistically similar with each other. The conventional cotton-wheat system produced 12686.33 kg ha^{-1} dry matter and it was the least one from other cropping systems. Wheat - mashbean - soybean, wheat - guar, wheat - fodder maize - mashbean, wheat - fodder sorghum - mungbean, wheat - fodder maize - soybean, wheat - mungbean - grain millet and wheat - fodder millet - grain maize cropping systems produced 15, 11, 7, 7, 7, 6 and 4% higher wheat total dry matter over conventional cotton - wheat system. Increase in total dry matter and yield of crops with the inclusion of legume and other restorative crops were also observed by Ahmad et al. (2001) and Reddy and Suresh (2009).

Grain yield

Data showed significant effect of wheat based cropping rotations on the productivity of wheat crop. The result indicates the achievement of better yield in different wheat-based rotations. The maximum (4.60 t ha^{-1}) wheat yield was observed in wheat-mashbean-soybean cropping system followed by wheat-guar cropping system (4.39 t ha^{-1}). The cropping system viz. wheat-fodder maize-mashbean, wheat - fodder sorghum - mungbean, wheat - fodder maize - soybean and wheat - mungbean - grain millet produced 4.22, 4.21, 4.21 and 4.18 t ha^{-1} wheat and these were statistically at par with each other. The conventional cotton - wheat system produced 3.91 t ha^{-1} of wheat. The possible reason of higher yield may be due to inclusion of legumes in these wheat-based rotations. The current wheat was sown after the harvesting of spring and autumn crops resultantly the better crop as well as soil productivity. It was mainly due to incorporation of legumes crops in rotations. Wheat - mashbean - soybean, wheat - guar, wheat - fodder maize

Table 1. Total dry matter and yield of different wheat-based rotations.

Cropping Systems	TDM (kg ha^{-1})			Yield (t ha^{-1})		
	Wheat	Spring	Autumn	Wheat	Spring	Autumn
Cotton – Wheat	12686.33^{e}	12125.00^{a}	--	3.92^{e}	3.20^{d}	--
Wheat – Guar	14214.03^{b}	3405.13^{c}	--	4.39^{b}	1.31^{d}	--
Wheat-Fodder Maize-Mash bean	13661.43^{c}	9300.00^{ab}	2826.76	4.22^{c}	58.73^{a}	0.69^{b}
Wheat-Fodder Sorghum-Mung bean	13631.38^{c}	9826.67^{ab}	2967.66	4.21^{c}	41.45^{c}	0.64^{b}
Wheat-Fodder Maize-Soybean	13607.68^{c}	8989.00^{bc}	1855.11	4.21^{c}	55.73^{a}	0.63^{b}
Wheat-Fodder Millet-Grain Maize	13196.46^{d}	14300.00^{a}	1459.33	4.08^{d}	50.60^{b}	7.07^{b}
Wheat-Mash bean-Soybean	14893.50^{a}	3791.99^{c}	2116.56	4.60^{a}	0.79^{d}	0.69^{b}
Wheat-Mung bean-Grain Millet	13534.56^{cd}	3672.26^{bc}	6496.49	4.18^{c}	0.68^{d}	2.32^{a}

Mean in the same column having different letters differs significantly at P≤ 0.05).

- mashbean, wheat - fodder sorghum - mungbean, wheat - fodder maize - soybean, wheat - mungbean - grain millet and wheat - fodder millet - grain maize cropping systems produced 15, 11, 7, 7, 7, 6 and 4% higher wheat grain yield over conventional cotton-wheat system.

In case of fodder production of the existing cropping systems, the maximum fodder yield (58.73 t ha^{-1}) was recorded in wheat - fodder maize - mashbean cropping system followed by wheat-fodder maize-soybean cropping system and both were statistically at par. It is concluded that with the exhaustive crops, restorative crops must be incorporated in the existing wheat based cropping systems in order to attain higher productivity of wheat crop and maintain soil health. The results are quite similar to the findings of Ahmad et al., (2001) and Reddy and Suresh (2009) (Table 1).

Soil fertility

The data on different soil parameters recorded before planting of crop and at end of year after harvesting of second crop revealed that maximum organic matter (0.86%) was left in the soil by wheat - mashbean - soybean cropping system followed by wheat-fodder maize - mashbean. The possible reason of increment in organic matter is due to consecutive sowing of two pulses as well leguminous crop in this system. The maximum nitrogen (0.055%) was left in the soil by wheat - mashbean - soybean cropping system followed by wheat-fodder, maize - mashbean (0.05%) and wheat-mungbean- grain millet (0.05%).

Depletion in nitrogen was recorded by cotton-wheat and wheat- fodder millet-grain maize cropping systems. The maximum available phosphorus (8.45 ppm) was noted in the soil by wheat - mashbean - soybean cropping system followed by wheat-guar (8.24 ppm) and wheat-mungbean- grain millet (8.15 ppm). However, reduction in available phosphorus was recorded by cotton-wheat (7.43 ppm) and wheat- fodder millet-grain maize (7.62 ppm) cropping systems. The maximum potash (166 ppm) was recorded in the soil by wheat - mashbean - soybean cropping system followed by wheat-guar (165 ppm) and wheat-fodder maize-soybean (162 ppm). The minimum amount of potash (147 ppm) was noticed in wheat- fodder millet-grain maize cropping system. Ghosh, (1987) also reported that addition of legumes and pulses into existing cropping systems can enhance soil fertility (Table 2).

Economic analysis

Benefit-cost ratio (BCR)

Benefit-Cost Ratio (BCR) is informal approach for making decisions of any kind. A ratio of greater than one shows that the system is a viable one. The maximum value of BCR (2.39: 1) was achieved in wheat - fodder millet - grain maize followed by wheat - fodder maize - mashbean with BCR of 1.87: 1. It was due to less cost of production of grain maize crop and it gave the maximum net return due to high grain yield and market price. The minimum value of BCR (1.47:1) was achieved in wheat - guar cropping system. The reason for low BCR is the less production of guar crop. Wheat - fodder maize - soybean and

Table 2. Effect of different wheat-based crop rotations on soil fertility.

Cropping systems	Organic matter (%)		Nitrogen (%)		Available Phosphorus (ppm)		Potash (ppm)	
	Initial level	Final level	Initial level	Final level	Initial level	Final level	Initial level	Final level
Cotton – Wheat	0.84[a]	0.8[d]	0.047[a]	0.044e	8[a]	7.43f	144[a]	154[d]
Wheat – Guar	0.84[a]	0.83[c]	0.047[a]	0.049[c]	8[a]	8.24[b]	144[a]	165[ab]
Wheat-Fodder Maize-Mash bean	0.84[a]	0.85[ab]	0.047[a]	0.050[b]	8[a]	8.12[c]	144[a]	150e
Wheat-Fodder Sorghum-Mung bean	0.84[a]	0.84[b]	0.047[a]	0.048[d]	8[a]	8.13[c]	144[a]	159[c]
Wheat-Fodder Maize-Soybean	0.84[a]	0.83[c]	0.047[a]	0.049[c]	8[a]	8.09[d]	144[a]	162[b]
Wheat-Fodder Millet-Grain Maize	0.84[a]	0.79e	0.047[a]	0.042f	8[a]	7.62e	144[a]	147f
Wheat-Mash bean-Soybean	0.84[a]	0.86[a]	0.047[a]	0.055[a]	8[a]	8.45[a]	144[a]	166[a]
Wheat-Mung bean-Grain Millet	0.84[a]	0.82[cd]	0.047[a]	0.050[b]	8[a]	8.15[bc]	144[a]	155[cd]

Table 3. Economic analysis of different wheat-based crop rotation.

Cropping systems	Cost (Rs. ha^{-1})				Income (Rs. ha^{-1})				Net profit	Benefit-Cost Ratio
	Wheat crop	Spring crops	Autumn crops	Total cost	Wheat crop	Spring crops	Autumn crops	Gross income		
Cotton – Wheat	138859	99877	----	**238736**	146069	223007	----	**369076**	**130340**	**1.55 : 1**
Wheat – Guar	138859	26514	----	**165373**	161164	81854	----	**243019**	**77646**	**1.47 : 1**
Wheat-Fodder Maize-Mash bean	138859	38477	29382	**206717**	154295	161508	69958	**385760**	**179043**	**1.87 : 1**
Wheat-Fodder Sorghum-Mung bean	138859	35437	36682	**210977**	153606	82900	62252	**298758**	**87781**	**1.42 : 1**
Wheat-Fodder Maize-Soybean	138859	38477	40923	**218259**	153965	153258	76726	**383949**	**165690**	**1.76 : 1**
Wheat-Fodder Millet-Grain Maize	138859	23057	48647	**210562**	149484	75895	278690	**504069**	**293507**	**2.39 : 1**
Wheat-Mash bean-Soybean	138859	29382	40923	**209164**	167287	74487	84545	**326319**	**117155**	**1.56 : 1**
Wheat-Mung bean-Grain Millet	138859	36682	29954	**205494**	153489	65929	91753	**311171**	**105677**	**1.51 : 1**

wheat-mashbean - soybean gave BCR of 1.76:1 and 1.56:1 respectively and were at 3rd and 4th position in the term BCR (Table 3).

Dominance analysis of wheat-based rotations:

A cropping system was dominated, denoted by "D" if its variable cost was higher but net benefit was lower than the preceding systems. The dominance analysis of wheat based rotations revealed that wheat- mashbean - soybean, wheat - fodder sorghum - mungbean and cotton - wheat cropping systems were dominated by rest of the cropping systems under study. The dominated cropping systems were actually less profitable than other cropping systems.

Marginal rate of return (MRR)

The data for the analysis of Marginal Rate of Return (MRR) revealed that if instead of wheat - guar, wheat - mungbean - grain millet rotations is recommended then MRR is 69.87%. This implied that for every 100 rupees invested in guar production, the farmers can expect to recover Rs.100 and obtain an additional amount of Rs. 69.00 in wheat - mungbean - grain millet cropping systems. The replacement of wheat - guar system with wheat - mungbean - grain millet cropping system is not a good option for farmers. This was due to high marginal cost along with low marginal

Table 4. Dominance analysis of different wheat-based rotations.

S/N	Cropping systems	TCV (Rs. ha^{-1})	NB (Rs. ha^{-1})
T_2	Cotton – Wheat	**165373**	77646
T_8	Wheat – Guar	**205494**	105677
T_3	Wheat-Fodder Maize-Mash bean	**206717**	179043
T_7	Wheat-Fodder Sorghum-Mung bean	**209164**	117155 D
T_6	Wheat-Fodder Maize-Soybean	**210562**	293507
T_4	Wheat-Fodder Millet-Grain Maize	**210977**	87781 D
T_5	Wheat-Mash bean-Soybean	**218259**	165690
T_1	Wheat-Mung bean-Grain Millet	**238736**	130340 D

TCV=Total variable cost, NB=Net benefit.

Table 5. Analysis of marginal rate of return of different wheat-based rotations.

S/N	Cropping systems	TCV (Rs. ha^{-1})	MC (Rs. ha^{-1})	NB (Rs. ha^{-1})	MNB (Rs. ha^{-1})	MRR (%)
T_2	Cotton – Wheat	**165373**	---	77646	---	---
T_8	Wheat – Guar	**205494**	40122	105677	28031	**69.87**
T_3	Wheat-Fodder Maize-Mash bean	**206717**	41345	179043	101397	**245.25**
T_7	Wheat-Fodder Sorghum-Mung bean	**209164**	43791	117155	39509	**90.22**
T_6	Wheat-Fodder Maize-Soybean	**210562**	45190	293507	215861	**477.68**
T_4	Wheat-Fodder Millet-Grain Maize	**210977**	45605	87781	10135	**22.22**
T_5	Wheat-Mash bean-Soybean	**218259**	52886	165690	88044	**166.48**
T_1	Wheat-Mung bean-Grain Millet	**238736**	73364	130340	52694	**71.83**

TCV=Total variable cost, NB=Net benefit, MC=Marginal cost, MNB=Marginal net benefit, MRR=Marginal rate of return, BCR=Benefit cost ratio

net benefit. The maximum MRR (477.68%) was calculated in wheat - fodder millet - grain maize cropping system followed by wheat - fodder maize - mashbean system with MRR of 245.25% (Tables 4 and 5).

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Determinants of khat chewing among urban households of Wolkite Town, Gurage Zone, Ethiopia

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Khat is the second largest export item with great economic value in Ethiopia, but the ongoing increased number of chewers in the country indirectly affects economic productivity by decreasing work-hours, household's economic production, diversion of money to buy khat, absenteeism from work and unemployment. The study aimed at analyzing the status of khat consumption and identifying the determinants of consumption level of khat in Wolkite town of Ethiopia. Primary and secondary data sources were used to obtain relevant data required for this study. A total of 110 sample respondents were used to collect primary data. Double hurdle model was employed to identify the determinants of khat consumption. The Probit part of the model result revealed that age of respondents, religion, educational level, peer- influence and perceived benefit of khat determine consumption decision as expected. Results from truncated part of Double hurdle showed employment status, perceived benefit, education level, khat price and work environment susceptibility determine the level of khat consumption in the study area. It is to recommended to strengthen the provision of formal education, encourage youths' knowledge through different training and experience sharing, facilitate a program to provide especial education on socio- economic and health consequences of khat chewing to primary, secondary, preparatory and university students, reduce unemployment through providing option job opportunities, strengthen the provision of a choice of sport station and facilities to the society, and enhance safe working environment for khat chewing to be done by required stakeholders.

Key words: Consumption, double hurdle model, Khat, Wolkite.

INTRODUCTION

Khat (*Catha edulis Forsk*.) is an evergreen flowering tree or shrub mainly cultivated in east Africa horn and peninsula area. It originated from Ethiopia and was imported to Djibouti, Somalia, Kenya, Uganda, Tanzania, Zimbabwe, Zambia, South Africa and Yemen (Berhanu et al., 2014). It is a naturally occurring stimulant that is consumed by plucking off the leaves of the khat tree and could it be used for a recreational purpose for its effects such as euphoria and increased alertness (Axel et al., 2012).

Khat is estimated to be chewed by more than five to ten million people each day, although its use is largely in East

African countries and South-western Arabia (Erica et al., 2009). In Ethiopia, khat chewing is becoming habitual and the proportion of people chewing khat has significantly risen over the years and chewers' population in Ethiopia is now 16% from the country's population (Gebrie et al., 2018). Moreover, the percentage of khat chewing among regions of Ethiopia ranges from 1.1 to 53.2% with the overall prevalence of 15.3% (Haile et al., 2015; Amsalu et al., 2017).

Private home, shops, cars and workplaces are among places where khat is largely chewed in the country and chewers become talkative, elated, and get a feeling of wellbeing and power and elevated self-esteem (WHO, 2015). Khat chewing results in social isolation, family breakdown, loss of one's responsibilities and reduces overall economic production. It also causes mental, physical, and reproductive health consequences (Berhanu et al., 2014; Omur et al., 2015; Gebrie et al., 2018). Furthermore, chewing of khat has serious socio-economic effect on households' income to fulfill nutritious food, home improvement, education or other family needs and finally leads to financial problem and family breakdown. It also affects working hours, causes absenteeism from work, absenteeism from class and poor academic performance of the students and unemployment (Amsalu et al., 2017; Beyene et al., 2017; Ng'ethe, 2015; Muluneh, 2018).

The consumption of khat leaves is mostly practiced by adults in all regions and ethnic groups. Hence, most khat chewers are adults and exist in the active production stage, country labor force economic production, and chewers' livelihood situation remains questionable. This implies reducing number of chewers through identifying and reducing determinants is essential.

Literature has revealed that a number of factors cause the increased khat consumption in different regions of Ethiopia. Among them are normalization in the community, social mobility to most khat chewing community, perceived non -side effect, affordability, type of occupation and availability of khat leaf in the whole year (Haile et al., 2015; Megerssa et al., 2014). Likewise, joblessness, less family level control of khat chewing, absence of social banned mechanism, khat chewing as indicator of city boy at higher educational institutions, lack of interest to work and family dependence are factors that increase the number of chewers (Muluneh, 2018). Besides, limited attention on the socio-economic and health consequences and absence of government interference to control consumption cause the expansion of khat in Ethiopia.

Gurage Zone, which is one of the large khat producers in the country, is one of the potential areas in which khat is largely produced and consumed in Ethiopia; it has many chewers in both urban and rural areas. Wolkite, which is the capital town of Gurage zone, has a great number of chewers. A lot of chewers are observed in the town. As a result, it is essential to study the causes of the increased number of chewers and provide information for the required stakeholder. Therefore, this study was aimed at identifying factors influencing the increased khat consumption habit of households in Wolkite town, Guragea Zone, Ethiopia.

MATERIALS AND METHODS

Description of the study area

The study was conducted in Gurage Zone. Its geographical location is from 7° 44' 46" to 8° 28' 29" N latitude and 37° 27' 30" to 38° 42' 42"E longitudes. Wolkite town is located in Guragea zone of Southern Nations, Nationalities and Peoples Regional State (SNNPRS), Ethiopia (Figure 1). It is the capital town of the zone and located at 158 km South of Addis Ababa on the way to Jimma town and 427 km from the regional city, Hawassa. The population is estimated to be 41988 (GZEDD, 2015). Khat is chewed in Wolkite town among all regions and ethnic groups. Khat is easily accessible to the users; the users are able to get it at low cost and whenever needed and it leads to the prevalence of khat chewing in the study areas (Figure 1).

Data source and collection methods

Both primary and secondary data sources were used to coduct the study. Primary data were collected by using pre-tested semi-structured interview schedule. The primary data collected were on khat prices, amount of expenditure for khat purpose, monthly income, eductional level of respondents, employment status, influence of peers for khat chewing, percived benefit from khat, and other socioeconomic variables assumed to affect khat chewers' chewing decision and level of khat consumption. Likewise, secondary data were used for cross checking the study result from pervious emperical literature and that obtained from different journal and websites.

Sampling method and sample size

The target populations for this study were individual khat chewers, khat traders and producers who participate in khat market in Wolkite town. A random surveying at khat chewing houses and

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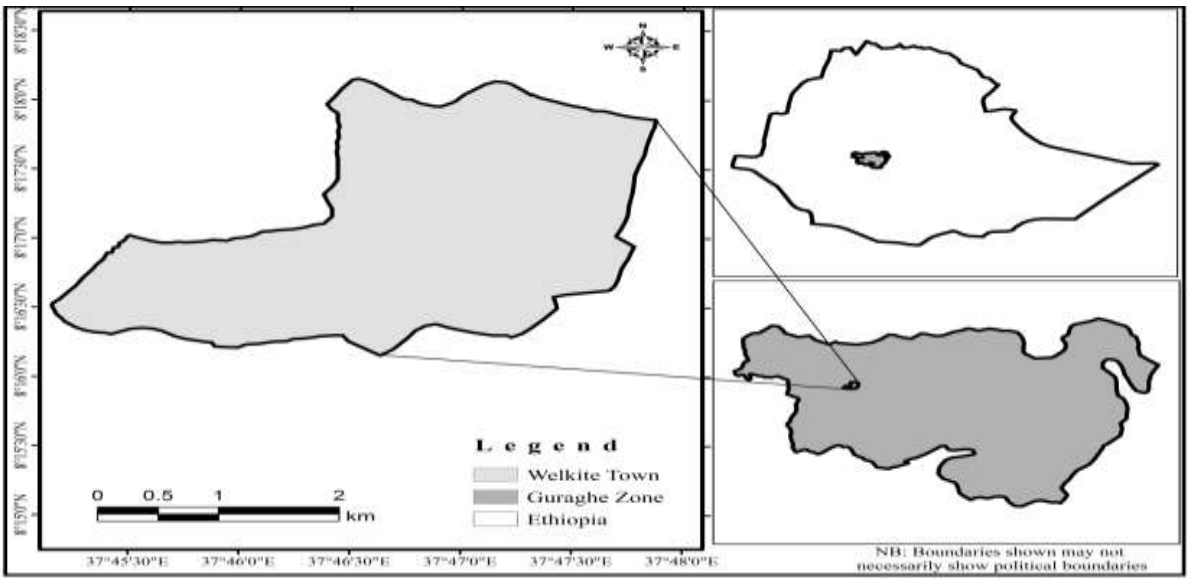

Figure 1. Location map of the study area.

market place in Wolkite town was used to collect primary data. The sample size for this study based on what most statisticians and econometricians consider to determine optimal sample size for regression (sample size (m) is 10 or more times the number of relevant independent variables) in a given model (Green's, 1991). Thus, based on the above justifications, a sample size of 110 sample respondents was drawn for generalized findings.

Method of data analysis

Two types of data analysis methods, namely descriptive statistics and econometric models were used for analyzing the data collected from individual khat chewer, khat traders and market supplier producers. Stata software version 13 was used to analyze the data.

Discriptive method of analysis

Descriptive and inferential statistical analysis method such as mean, proportions, percentages, t-test and chi-square test were used in the process of examining and describing farm households' socio-demographic variable and to evaluate the existence of significant difference in these variables among khat chewers and non-chewers.

Econometric model specification

The dependent variables analyzed in this study are to determine the consumption decisions of individuals and intensity of consumption, simultaneously. Heckman two-stage approach Tobit model and double hurdle model have been mostly used to determine such type of response variable (Komarek, 2010).

Heckman regression is made for incidental truncation, where zero reflecting missing value, that is, unobserved value or not selected (Ricker-Gilbert et al., 2011). However, zero value in market, consumption and agronomic conditions revealed households' rational choice rather than missing value which is contrary to what is assumed by Heckman (Byron et al., 2012). Likewise, in this study zero value represents respondents' rational choice to chew rather than missing value.

Tobit regression model is applicable when the dependent variable is available only for some observation and when the consumption decision and intensity of consumption assumed to be interdependent. Recent empirical analyses have shown the inadequacy of the standard Tobit model in cross-sectional analysis of special commodity like tobacco consumption, stressing the relevance of a double hurdle approach for microeconomic analysis of such commodity consumption (Garcia and Labeaga, 1996; Yen and Jones, 1996). This may be due to the reason that in special commodity like khat and tobacco, the consumption decision may not depend on price and income and in this case the determinants of the two decisions are allowed to differ.

As stated in Cragg (1971) Double-hurdle model assumed that two separate hurdles must be passed before a positive level of consumption can be observed. This implies Double hurdle model is the right choice if the two decisions are determined by different sets of explanatory variables. Due to this reason Double hurdle model was chosen for analyzing the determinants khat consumption decision (first hurdle) and intensity of khat consumption (the second hurdle). Likewise, according to Berhanu and Swinton (2003) log-likelihood ratio test that compares the tobit and the sum of Probit and truncated regression model showed Double hurdle as best fit than Tobit.

For this study, the intensity of khat consumption was measured by the amount of money spent for khat chewing purpose per month by individual's chewers. Therefore, this variable is taken as continuous limited dependent variable. It can be zero or some value greater than zero.

The econometric specification of the Double hurdle model assumed that both hurdles are to be linear in the parameters (α, β),

Table 1. Definition and hypothesized variables to influence probability and level of khat consumption.

Dependable variable	**Excepted sign**
Probit Model (1 = chewed, 0 = otherwise) Truncated Model (Amount of money spent for khat consumption per month in birr)	
Independent Variable	
Age of respondents (Age)	Negative
Sex of respondents (1 if male, 0 Otherwise)	Positive
Educational status (Education in formal years of schooling)	Negative
Income (Income)	Positive
Marital status (1 if married, 0 if not)	Positive/ negative
Religion (1 if Muslim, 0 if others)	Positive
Employment status (1 if employed, 0 unemployed)	Negative
Perceived benefit (1 if perceived, 0 otherwise)	Positive
Price of Khat (ETB)	Negative
Peer influence (1 if yes, 0 if not)	Positive
Work environment (1 if susceptible, 0 otherwise)	Positive
Family acceptance (1 if okay, 0 otherwise)	Positive

Source: Literature reviewed.

with disturbance terms u and v randomly distributed with a bivariate normal distribution. The matrices z and x include the variables that are assumed to influence consumption decisions and intensity of consumption, respectively. According to Jones and Pudney (1989), the bivariate model can be written as:

i) Observed consumption

$$Y_i = \mathrm{d}.y_{\mathrm{i}} ** \quad (1)$$

ii) Participation in chewing decision

$$w_i = \mathrm{Z}_i'\alpha + u_i \;; u_i \sim N(0,1) \quad (2)$$

$$d = \begin{cases} 1 & \text{if } \mathrm{w} > 0 \\ 0 & \text{otherwise} \end{cases}$$

iii) Level of Khat consumption equation

$$Y_i^* = \chi_i'\beta + \mathrm{v_i},\ v_i \sim N(0,\delta_1^2) \quad (3)$$

$$Y_i^{**} = \begin{cases} Y_i^*, \text{if } Y_i^* > 0 \\ 0, \text{otherwise} \end{cases}$$

Where: $\boldsymbol{w_i}$ is unobserved (latent) variable for the participation decision in Khat Chewing practices, d is the observed discrete decision of the individuals whether he/she has participated or not in Khat chewing practices.

The subscript i refers to the i[th] household, Z_i's are the index of explanatory variables determining the participation decision of the individuals in Khat chewing practices, $\alpha's$ refers to the index of parameters related with explanatory variables determining participation decision of the individuals, u_i is the error term of the participation equation which is normally distributed $(u_i \sim N(0,1))$, with zero mean and variance one, $\mathrm{Y_i}^*$ is unobserved (latent) variable for the level of Khat consumption, $\mathrm{Y_i}^{**}$ is the observed amount of money spent for khat chewing purpose per month, χ_i''s are the index of explanatory variables determining the level of Khat consumption by the chewers, $\beta's$ refers to the index of parameters related with explanatory variables determining level of Khat consumption by the chewers, $\boldsymbol{v_i}$ is the error term of the level of Khat consumption, which is normally distributed (level of Khat consumption by the chewers, $\mathbf{v_i} \sim N(0,\delta_2^2)$)with zero mean and constant variance.

As shown above, a positive level of Khat consumption y is observed only if the respondent is a potential chewer (d = 1) and actually consumes khat (y**). In this respect double-hurdle model is different from Heckman selection model (Heckman, 1979), in which zeros are not affected by the consumption decision, observed zero expenditures are the result of both consumption decisions and potential chewer may have zero khat expenditure.

Definitions and hypothesis of variables

Dependant variables

Khat consumption decision: A limited dependent variable taking value of 1 if the individuals chew khat and 0 if not. It is used to identify the factors determining the khat consumption decisions.

Intensity of Khat consumption: It is a continuous variable measured in the average amount of money (expenditure) that individuals (chewers) used up for Khat chewing purpose. It represents the actual average monthly amount of money incurred for purchasing Khat in Birr (ETB) by sampled individuals in surveyed year.

Explanatory variables

Based on economic theory and empirical studies conducted before, the following explanatory variables were hypothesized to affect consumption level of individuals and summarized in Table 1.

Table 2. Summary statistics, mean comparison and proportion test (chi-square test) among chewers and non-chewers.

Total observation =110		Non-chewer =28	Chewer =82	T- value
Continuous variable	**Mean**	**Mean**	**Mean**	
Age	37.97	42.85	36.30	6.55***
Income (ETB)	2664	2848	2598.76	249.51
Education	5.009	7.55	4.03	3.51***
Dummy variable	**Percentage**	**Percentage**	**Percentage**	**Chi^2 value**
Sex (Male %)	90.09	85.71	92.68	-0.069
Marital status (Married %)	70.90	53.57	76.82	-0.232**
Religion (Muslim %)	70.00	60.71	73.17	-0.124
Employment status (Employed %)	64.54	85.71	57.31	0.283 ***
Peer influence (Influenced %)	50.09	42.85	64.63	-0.217**
Family acceptance in khat (positive %)	51.18	42.85	54.87	-0.120
Work environment (Susceptible %)	62.72	42.85	69.51	-0.266**
Perceived benefit (Beneficial)	47.27	28.57	53.65	-0.250**

** and ***, shows significant at 5 and 1% level.
Source: Own computation from survey data, 2017

RESULTS AND DISCUSSION

Socioeconomic characteristics of sample respondents

The collected data from 110 sample respondents are analyzed to depict the demographic, economic and characteristics of khat chewers in Wolkite town. Among the sampled respondents, 74.55% were khat chewers while 25.45% were non – chewers. The mean age of non-chewers was 42.85 years and that of chewers was 36.30 years; there was a significant mean difference between the non-chewers and chewers and was significant at 1% significant level. Based on the result the mean age of non-chewers was higher as compared to chewers and most chewers' were youths in the study area. Regarding educational level, the average educational level of respondents in year of schooling for non-chewers was 7.55 years, which is greater than chewers which were about 4.03 years; it was significant at 1% significant level (Table 2). This is due to the reason that individuals become wise in making decision and allocating income as they spent more years in formal education.

About 53.57% of the non-chewers and 76.82% of the chewers were married. The result reveled there were proportion difference between chewers and non-chewers in terms of marital status and it was significant at 5%. Likewise, the analysis on proportion of households on employment status implied that about 85.71% of non-chewers and 57.31% of chewers were employed and there is mean proportion difference between two groups and it was significant at 1 % significant level. Moreover, there is significant mean proportion difference regarding peer-influence, working environment susceptibility and perceived benefit from khat chewing between chewers and non-chewers and it was significant at 5% significant level

Factors affecting consumption decision of Khat

The result presented in Table 3 shows the output of double hurdle model (probit part) estimated. The probit regression result showed that out of the ten explanatory variables, five explanatory variables namely respondent's age, religion; educational status, peer influence and perceived benefit from chewing were found significantly determining the consumption decision of the individuals in Khat chewing at different significance levels.

Age of respondent

This variable had negative and significant effect on the household decision to chew khat and it was significant at 5%. An increase in the respondents' age by one year decreases likelihood of khat consumption by 4.8%, other factors being constant. It implies older individuals may be deciding to wait for not chewing in order to deal with their family cases unlike younger that may be sensitive to do

Table 3. Estimated part of double hurdle model.

Variables	1st hurdle Coefficient	Rob Std. Err.	Marginal Effect	2nd hurdle Coefficient	Robust Std. Err.	Z
Sex	0.65	0.542	0.656	0.001	0.19	0.01
Age	-0.04**	0.019	-0.048	-0.003	0.005	-0.64
Marital status	0.43	0.358	0.431	0.04	0.112	0.36
Religion	0.58*	0.345	0.584	-	-	-
Education	-0.10***	0.041	-0.108	-0.02**	0.011	-2.05
Employment	-0.38	0.360	-0.380	-0.28**	0.113	-2.54
Family acceptance	0.05	0.339	0.046	-	-	-
Work environment	0.46	0.337	0.467	0.19*	0.102	1.95
Peer influence	0.54*	0.321	0.536	0.01	0.099	0.14
Perceived benefit	0.77**	0.333	0.773	0.15*	0.092	1.67
Income (log)	-	-	-	0.22***	0.075	2.98
Khat price(log)	-	-	-	-0.68***	0.208	-3.28
Constant	1.19	1.005		7.13***	1.153	6.19
N		110				
Wald chi2(10)		30.35				
Prob > chi2		0.0007				
Log likelihood		-80.495				

*, ** and *** indicates significant at 10 and 1% respectively.
The 1st hurdle in the above table refers probit part and the 2nd hurdle refers the truncated part of double hurdle model.
Source: Own computation from survey data, 2017.

what they observe in their life and khat chewing. Study by Awel et al. (2016) is in confirmation with this finding.

Religion of respondent

It had a positive and significant effect on the decision of respondent to chew khat and it was significant at 10%. Thus, a shift from Christianity to Muslim religion would increase the likelihood of khat consumption by 58.4%, keeping other factors being constant. This result is in line with those of Berhanu et al. (2014).

Educational levels of respondent

As expected, it affects khat consumption decision of individuals negatively and significant at 1%. A unit increase in educational level in formal years of schooling decreases the likelihood of khat consumption by 10.8%, keeping other factors being constant. The result implies education enhances individual knowledge in social, economical and health related cases and those educated individuals may be keeping them from chewing khat. This is in line with the finding of Muluneh et al. (2018) who revealed that integrate education of the potential health problems of khat chewing is important to reduce the number of chewers.

Peer influence

As hypothesized, it had positive and significantly influenced the khat consumption decision at 10% significant level. The result revealed that as individuals become influenced by peers would increase the likelihood of khat consumption by 53.6% compared to those not individuals not influenced, keeping other factors being constant. This is in line with the finding of Awell et al. (2016).

Perceived benefit from chewing

Expected benefit from chewing khat significantly determined khat chewing decision and it was significant at 5% probability level. Individuals who perceived benefit from chewing khat, about 77.3% more likely to chew khat relative to individuals who did not perceive any benefit from chewing khat, keeping other factors being constant.

The truncated part of Double hurdle model regression result in Table 3 showed that out of the ten explanatory

variables, six explanatory variables namely employment status, working environment/condition; educational level, monthly income, average price of khat and perceived benefit from chewing were found significantly determining the intensity of khat consumption.

Educational level

As hypothesized the educational level of chewers negatively and significantly influences the intensity of khat consumption at 5% significant level. As educational of individual is increased by one year in formal education, the intensity of khat consumption decreases by 2%. It implies that as educational level of respondent increases, knowledge on socio-economic effect and associated effect of khat is enhanced and this discourages them from chewing.

Employment status

As expected of individual employment condition is significantly and negatively determining the intensity of khat consumption and it was significant at 5%. The amount of expenses of khat increases by 28% if the chewers are employed as compared to its counterpart. The result implies as chewers become employed, less time available for chewing and thereby the amount of money spent for khat chewing purpose may decrease.

Working environment

It affects the intensity of khat consumption positively and significantly at 10% probability level. The amount of money expense for khat chewing purpose is increased by 19% if the individuals are employed in environment susceptible for khat as compared to its counterpart. It implies that building safe working environment that is not susceptible for chewing has the great potential on reducing khat chewing expenditure and thereby has high potential for increased production by increasing working hours and reducing absenteeism.

Perceived benefit from chewing

As expected perceived benefit from chewing was found to positively and significantly affect intensity of khat consumption at 10% probability level. The amount of money spent on khat increases by 15% if the chewers perceive any benefit from chewing khat as compared to its counterparts. This result implies that individual who expects benefit from khat chewing may always tend to chew khat to do something and his psychology would become khat dependent and this increases expenditure on khat.

Income (log)

Monthly income of individuals significantly and positively affects the intensity of khat consumption and it was significant at 1% significant level. The result revealed that, 1% increase of income of chewers is associated with 0.22% increase in amount of money spent on khat consumption, holding all other factors constant. This implies that chewers with larger monthly income were more likely to engage in khat market frequently as buyers.

Khat price

Average price of khat per punch also positively and significantly affects the extent of khat consumption at 1% significance level. One percent increase in the price of khat decreases the amount of money spent for khat consumption by 0.68%. The higher the price of khat, the less the amount allocated for khat chewing thereby decreasing the intensity of khat consumption, all other factors being kept constant.

CONCLUSION AND RECOMMENDATIONS

Khat chewing (Catha edulis Forsk) is dominantly known in certain areas of Ethiopia including Wolkite town. The study found that the decision to chew khat was negatively influenced by age and education level of respondents and also positively influenced by religion, peer- influence and perceived benefit from chewing. And also the intensity of Khat consumption was negatively influenced by employment status, educational level and khat price while positively influenced by, working environment, monthly income and perceived benefit from chewing.

It is recommended to strengthen the provision of formal education, encourage youths' knowledge through different training and experience sharing, facilitate a program to provide especial education on socio-economic and health consequences of khat chewing to primary, secondary, preparatory and university students as done for HIV AIDS, reduce unemployment through providing option job opportunities, strengthen the provision of a choice of sport station and facilities to the society, and enhance safe working environment for khat chewing to be done by required stakeholders.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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