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Determinants of Household Income Incase of Dera District, Oromia Regional State, Ethiopia

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ABSTRACT

Background: Agriculture plays a key role in economic growth, as a source of raw materials, means of income generation, food security, poverty alleviation and employment to the rural population in both developed and developing countries. This study was aimed to investigate the determinants of household income incase of Dera district, Oromia Regional State, Ethiopia.

Methods: The study was conducted in Dera district from September 2020 to May 2021 at Salale University, Ethiopia. Both primary and secondary source of data were used to obtain the data. Primary data was collected from the selected sample of 234 household heads using structured questionnaire. Multistage random sampling technique was used to select representative sample from Dera district. Both Descriptive statistics (frequency, percentage, mean, variance, *etc*.) and Econometrics model (multiple linear regression model) were used to achieve the objectives of the study and to analysis the data.

Result: Using multiple linear regression of two stage least square, household income was significantly affected by place of residence, women household head, women year of education, farm size, access to credit, tropical livestock Unit and women time use at 5% significance level.

Key words: 2SLS, Household income, Rural women, Time use.

List of abbreviations: CSA: Central Statistical Agency; FAO: Food and Agriculture Organization; FLFP: Female Labor Force Participation; GDP: Gross Domestic Product; Ha: Hectares; HHI: Household Income; Hr: Hour; IV: Instrumental variables; MLRM: Multiple Linear Regression Model; NTP: No Time Poor; OLS: Ordinary Least Squares; TLU: Tropical Livestock Unit; TP: Time Poor; TU: Time use; TUOHW: Time use outside the house work; TUIHW: Time use inside the house work; VIF: Variance Inflation Factor; 2SLS: Two stage least square.

INTRODUCTION

Agriculture plays a key role in economic growth, as a source of raw materials, means of income generation, food security, poverty alleviation and employment to the rural population in both developed and developing countries (Afzal *et al.*, 2009). Agriculture is the most important sector in the Ethiopian economy and accounts for around 40% of GDP and 90% of total foreign exchange earnings. According to the Central Statistical Agency's (Ethiopia Central Statistical Agency, 2013) population projection, the population of Ethiopia is about 90 million. Among these, more than 80% of the population live in rural areas and depend on subsistence agriculture. Despite its high contribution to the overall economy, this sector is influenced by many factors, of which time use is the major ones. Hence, understanding the determinant factors of household income is essential to inform policies and design strategy to reduce the problem.

In most of Sub-Saharan Africa, including Ethiopia, women are the backbone of the rural economy with about 80 per cent of women being employed in agriculture and accounting for 70 percent of food production. Time use data confirm that women are indeed the continent's principal for food production and have primary responsibility for food availability in the family. However, most economic perspectives pay little or no attention to unpaid economic activities (Blackden *et al.*, 2006). Therefore, this study tried to see the effect of time use of paid and unpaid work on household income.

The study conducted in India showed that the contribution of household women in the net income of the farms was 55.39 and 55.01 per cent in case of marginal and small farm respectively and the total of 274.08 Mondays employment generated on the farms through the adoption of dairying activity (Sharma *et al.*, 2020). The study conducted in reviled that the participation of farm women in decision making positively and significantly affected by variables like education, land holding, annual income, social participation and use of mass media (Unnati and Ankush, 2012).

There could be two ways to rely on the labor of the poor to increase income. One possibility would be to increase the productivity of that labor. The second possibility is to increase the working hours of the poor. In most countries, the standard

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of living is low and a large share of the population is poor, many individuals would like to work more in order to improve their condition (Blackden *et al.*, 2006; Gibson and Shrader, 2018). Therefore, this study gives greater emphasis to the second option, increase the working hours of the poor and examines the effect of women time use on household income.

Women play substantial roles in farming systems and are vigorously involved in farm and livestock management, but their contribution in farming systems is generally overlooked and undervalued which has reflected them as invisible workers. The study showed that carrying of dung through basket as head load is the highest hard work score (62.58) was a feminine farm operation performed by (88%) in FS3 followed by (83%) in FS4 (Verma *et al.*, 2018).

To my knowledge, no study has been conducted in Dera district regarding the determinants of household income with special emphasis to rural women's time use. This study is intended to address this research gap.

MATERIALS AND METHODS

Description of the study areas and period

The study was conducted in Dera district of Oromia regional state, Ethiopia. Dera district is one of the largest in area (160315 ha of land) which is found in North Showa Zone of Oromia Regional State, Ethiopia and located about 220 km north of the capital city Addis Ababa and 109 km north of Fitche town, the capital city of North Showa. Dera is well known by cash crop production and have may historical places.

Study population

The study population was total number of household farmers of Dera district who leave for more than six months.

Study period and place

This research has been conducted from September 2020 to May 2021 at Salale University, Ethiopia.

Sources of data and methods of data collection

Both primary and secondary data were used to answer the research questions and to achieve the objectives of the study. Primary data was collected from the selected sample of 234 rural farm households from Dera district.

Sampling techniques

To select a sub-population (sample) from the districts, a multistage random sampling followed by simple random sampling was used (William G. Cochran, 1977). Under multistage random sampling, there are two stages to be followed. In the first stage, the kebeles were assigned a unique number and the kebeles were selected using simple random sampling from the district. In the second stage, Households were selected using a simple random sampling technique from the kebeles.

Data analysis

Both descriptive and econometric models were used to analyze the data. Multiple linear regression was used to analyze the determinants (including WTU) of HHI using OLS and 2SLS estimation methods. SPSS and STATA Softwares were employed for the analysis of the data. The following methods were used as model adequacy checking: standardized residuals, test for normality assumption of the error term, checking for multicollinearity, test for presence of hetroscedasticity, test for error term is uncorrelated with explanatory variables, Cook's distance and $DFBETAS_{j(i)}$. Since the variable time use (TU) was not fixed, the coefficients of regression model were estimated using two stage least square (2SLS), instead of Ordinary least square (OLS) (MADDALA, 1992). 2SLS model is given by:

$$\hat{\beta}_{2SLS} = [X' Z(Z' Z)^{-1} Z' X]^{-1} X' Z(Z' Z)^{-1} Z' Y$$

Where;

$\hat{\beta}$-regression parameter/s, X-covariate variables, Z-is instrumental variables and y-is dependent variable (household income). R-Square (R^2) and Adjusted R-square ($\bar{R}^2$) were used for model selection criteria and the model was well fitted.

Variables of the study

Under this study, the dependent variable is total household income (HHI). It is a continuous variable which refers to the total rural annual household income (in Birr). Independent variables are thought to have influence on household income in different activities. Independent variables include personal characteristics, demographic, socioeconomic and time use factors that might have an influence on the dependent variable. Some common selected independent variables are: time use, age, education, land holding, livestock holding, accessed to extension, access to credit, household head and training.

RESULTS AND DISCUSSION

Summary statistics for covariate variables

The survey result indicates that the mean value of yearly household income (HHI) was 18087.57 birr with a standard deviation of 3491.385 birr. Regarding women time use (WTU), the result showed that mean and standard deviation were 9.895157 hr and 1.455897 hrs, respectively. The result also showed that the mean value of women time use outside the house work (WTUOHW) of the respondents in the sample was 6.963547 hrs with a standard deviation of 0.9658618 hr and the mean and standard deviation of women time use inside the housework (WTUIHW) of the sampled women were 2.93161 hrs and 1.207531 hrs, respectively (Table 1).

Normality test (Shapiro-Wilk Test)

Since p-value is smaller than 5% level of significance, it has been concluded that the data comes from a normally distributed population (Table 2).

Test of multicollinearity

All VIF values for continuous explanatory variables are less than 10. Therefore, there is no multicollinearity problem and

Table 1: Summary statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Household income	234	18087.57	3491.385	10391.05	32303
WTU	234	9.895157	1.455897	7.04	14.08
WTUOHW	234	6.963547	.9658618	3.89	9.97
WTUIHW	234	2.93161	1.207531	1	6.61

Table 2: Shapiro-Wilk for normality test.

Variable	Obs	W	V	Z	Prob>z
Error term	234	0.990	1.201	1.224	0.1104

Table 3: Variance Inflation factor (VIF).

Variable	VIF	1/VIF
Age	1.15	0.869182
Year of schooling	1.18	0.846531
Livestock holding	1.36	0.731983
Farm size	1.89	0.527342
Time use	1.42	0.704054
Time use outside housework	1.46	0.685160
Time use inside housework	1.29	0.772416
Mean VIF	1.38	

Table 4: White test (Sargan's test) for Hetroscedasticity.

Chi-square test	P-value
0.001	0.9965

simply it indicates that there is no linear dependence between explanatory variables (Table 3).

Test for presence of hetroscedasticity

White test is a statistical test used to identify whether there is constant variance or not. In 2SLS estimation, White test assumes that the errors are independently and identically normally distributed with constant varianc. Since, the p-value is smaller than 5% level of significance, the null hypothesis is not rejected and one could safely conclude that the error terms had constant variance (homoscedasticity) (Table 4).

Test for exogeneity of explanatory variables and validity of instruments

The result showed that the Wu-Hausman F- test for WTU, WTUOHW and WTUIHWis greater than its tabulated value (p-value less than level of significance). Therefore, women time use (WTU), WTUOHW and WTUIHW are endogenous variables. Therefore, OLS estimation is biased and inconsistent estimation for regression coefficient. Therefore, OLS estimation is no longer used in estimating regression coefficients and this problem overcome by using 2SLS estimation method in estimating regression coefficients (Table 5).

Determinants of household income (HHI)

TU is found negatively and insignificantly affect HHI. This specification account for the presence of endogeneity of time use and it instrumented by three variables: dependency ratio, the number of females in the family member and family size. Therefore, 2SLS analysis is used to address the endogeneity problem. The study showed that for one unit change in TU resulting in 571.899 Birr increase in mean yearly household income at 5% significance level, keeping other variables in the model constant. In addition to the TU, there are other covariates which have a significant (at 5% significance level) effect on the HHI under 2SLS estimation. These were: place of residence, household head, Education of women, Tlu, Farm, Credit, Time use, Time category (TUIHW ad TUOHW) (Table 6).

The same as a study conducted by (Gustafsson and Sai, 2009), the result indicates that average yearly household income was 6517.714 Ethiopian birr higher for those households in lowland residence as compared to those in high land residence, keeping other variables in the model constant. This might be due to the involvement of women in the lowland area in the production of cash crops. As opposed to previous study (Atieno, 2009), being household head has a negative and significant effect on the household income in comparison to not being household head. The result showed that average yearly household income was 618.2998 Birr lower for those women who are household head as compared to those who are not house hold head, keeping other variables in the model constant. Rural women's year of schooling has a significant and positive effect on household income which is similar to the previous study (Aikaeli, 2010; Akram *et al.*, 2011; Zahoor *et al.*, 2013). The result reveals that for one unit increase in women year of education leads to 163.00 Birr increase in mean yearly household income, keeping other variables in the model constant.

Livestock holding has a positive and significant effect on household income. The result shows that for one unit increase in livestock holding (TLU) would result in a 405.2022 Birr increase in average yearly household income, keeping other variables in the model constant. Farm size has a positive and significant effect on household income. This result is in line with studies conducted by (Aikaeli, 2010; Blackden *et al.*, 2006; Carletto *et al.*, 2007; Gustafsson and Sai, 2009). The result describes that mean yearly household income increases by 3441.096 Birr for a unit increase in farm size, keeping other variables in the model constant. In

Table 5: Test of exogeneity of explanatory variables and validity of instruments.

Variables	Endogeneity test		Validity of instrument		Over identifcation	
	F test	p-value	F-test	p-value	χ^2-test	p-value
WTU	9.799	0.0020*	5.137	p≤0.001*	7.78755	0.077
WTUOHW	7.900	0.0054*	24.558	p≤0.001*	.368298	0.5439
WTUIHW	6.372	0.012*	37.0051	p≤0.001*	0.044	0.835

Table 6: Determinants of household income.

	Time use				Time category			
Income	Coef.	Std. Err.	Z	P>z	Coef.	Std. Err.	Z	P>z
Constant	4665.173	2845.694	1.64	0.101	7458.524	2226.132	3.35	0.001*
Residence	7352.535	417.5987	17.61	p≤0.001*	7164.948	370.522	19.34	p≤0.001*
Age	-6.021207	10.87383	-0.55	0.580	-1.12664	9.98706	-0.11	0.910
Headed	-898.8915	266.7565	-3.37	0.001*	-842.0553	246.1274	-3.42	0.001*
Eduwomen	163.0026	43.75946	3.72	p≤0.001*	191.3243	40.51625	4.72	p≤0.001*
Tlu	405.2022	105.7633	3.83	p≤0.001*	268.8036	96.09922	2.80	0.005*
Farm	3441.096	148.9215	23.11	p≤0.001*	3450.928	139.4122	24.75	p≤0.001*
Extension	329.1901	245.1577	1.34	0.179	139.4886	233.9756	0.60	0.551
Credit	959.2696	261.6992	3.67	p≤0.001*	703.4833	241.6295	2.91	0.004*
Training	616.0272	323.541	1.90	0.057	-195.7478	293.7491	-0.67	0.505
Time use	571.899	264.0775	2.17	0.030*				
TUIHW					-359.2328	177.1814	-2.03	0.043*
TUOHW					628.0183	271.5383	2.31	0.021*

line with previous study (World Bank, 2009), access to credit has a positive and significant effect on the household income. The result shows that average yearly household income is 959.27 Birr higher for credit user women compared to those of non-credit user, keeping other variables in the model constant.

The coefficient of TUOHW is significant and positively affects HHI. The result shows that for one unit increase in TUOHW leads to 628.018 Birr increase in mean yearly household income, keeping other variables in the model constant. In addition, the coefficient of TUIHW is significant and negatively affects HHI. The result also shows that for one unit increase in TUIHW would result into 359.2328 birr increase in mean yearly household income, keeping other variables in the model constant.

CONCLUSION

The study was conducted in Dera district. Multistage random sampling technique was used to select a sample of 234 rural farmer women from Dera district. Both descriptive and inferential statistics were used for analysis of the data. Determinants of household income were analyzed by multiple linear regression model. Using multiple linear regression (2SLS), Household income was significantly affected by: Place of residence, women household head, women year of education, Farm size, Access to credit, Tropical livestock Unit and Women Time use.

Consent for publication

Not applicable.

Availability of data and materials

Upon request, the data in excel format is available for this manuscript (Corresponding Author is responsible for the data availability).

Competing interests

The authors declare that there is no competing interest.

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Authors' contributions

DGA, TAB and ATZ designed the research, collect the samples, wrote the paper, analyzed data; DG conducted research and had primary responsibility for final content. All authors read and approved the final manuscript.

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