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WHAT FACTORS CONTRIBUTE TO THE SMALLHOLDER FARMERS' FARM INCOME DIFFERENTIAL? EVIDENCE FROM EAST HARARGHE, OROMIA, ETHIOPIA

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ABSTRACT

Improvements in the farm household's income and identifying the factors contribute to its improvement is very critical for enhancing food and poverty reduction strategy of Ethiopia. The aim of this paper is to investigate the factors contributing to rural farm households' income differential in Haramaya district East Hararghe, Oromia, Ethiopia. The study used both primary and secondary data. Primary data was collected from 120 sample respondents in 2015 production year. The study was used linear regression model to identify contributing factors and the model output indicated that, irrigation use, livestock holding, education level of household head, cultivated area, age and amounts of fertilizer used were the significant variables that contribute to farm income differential in the study area. Therefore, the policy implication of the study is that, increasing and proper utilization of the aforementioned variable's should have get due attention to speed up the enhancement of rural farm household income.

Keywords: Contribute, Income differential and multiple linear regression model.

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Contribution/ Originality

Enhancing crop and livestock incomes are critical strategic issue and doing all possible efforts to alleviate the ever increasing agricultural problems is, therefore, not an assignment to be left for tomorrow. In this endeavor, identifying main factors contribute to the households' farm income has been taken as one important strategy to relieve agriculture from dependence on nature and thus improve its productivity. So, the result of the study would contribute to policy makers to design appropriate farm income diversification development strategies of the country in general and the region in particular. The result of the study would also help other researchers who need to conduct a research on related topics in the study area and elsewhere. The result also helps smallholder farmers to identify the effects of socio-economic factors on their farm income and take appropriate measures of developmental plan.

1. INTRODUCTION

In Ethiopia, about 83.9 % of total populations are living in rural areas and agriculture is main source of their livelihood. Since 2010, Agriculture become the second most dominant next to service sector of the country's economy, by providing employment for 80 % of the total labors force and contributes 42.7 % to Gross Domestic Product and 70 percent of foreign exchange earnings [1, 2] Agricultural productivity can be increased by using two

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ways. The first method is through improvement in technology given some level of input and the other option of improving productivity is to enhance the output per household labor ratio of rural household farmers, given fixed level of inputs and technology. This study was mainly concerned about the second option of increasing productivity i.e. output per labor input and output per cultivated area of land.

Ethiopia's agriculture is plagued by periodic drought, soil degradation caused by overgrazing, deforestation, high population density, and poor infrastructure (making it difficult and expensive to get goods to market). Yet agriculture is the country's most promising sector. A potential exists for self-sufficiency in grains and for export development in grains, vegetables, fruits and livestock. Many other economic activities depend on agriculture, including marketing, processing, and export of agricultural products. Production is overwhelmingly of a subsistence nature, and a large part of commodity exports are provided by the small agricultural cash-crop sector [3]. The sector remains dominated by a subsistence, low input low output rain fed farming system in which droughts periodically reverse performance gains with devastating effects on household food security and poverty levels [4].

It is clear that, agricultural development needs timely and adequate supplies of essential farm inputs. However, the investment capacity of majority of Ethiopian farmers is low, the poor farm household cannot afford to meet increased demand for the purchase of improved seeds, recommended quantity of fertilizer, buying or hiring of farm machinery etc; so lack of finance is one of the main reasons for low productivity in our agriculture. Ethiopia. However, lack of adequate farm management practices and low level of inputs applied, the highly rain fed dependent agriculture system are major challenges to sustain the agricultural production in Ethiopia [5, 6].

Despite the fact that, the agriculture sector is mostly susceptible in seasonal rain fall, the rural households are generating their family income from difference sources to averse the risk associated in agricultural farm sector. As a result the main source of income in most rural household of Ethiopia is derived from farm and non-farm activities. Agriculture is the primary source of rural income as 80% percent of the rural labor force is engaged, in this sector [2]. Non-farm income of the rural household referred to an income that the rural households generate from none of crop or livestock production during a one year of agriculture production period. Non-agricultural activities are not getting prevalence in rural Ethiopia because households are rarely practicing dominated by a subsistence agriculture sector. As a result of this, the income from nonfarm activity is also very low. Therefore, it is significantly important to identify the factors that affect agricultural productivity and find the methods of the rural household income improvements.

Important resources are being utilized by the Ethiopian government to improve the agricultural productivity and rural household income to alter the state of agriculture in the country. Material resource and human capitals are allocated towards this end. Extension workers, packages or programs, and agricultural inputs are some of the resources that are made available to farmers to change their style of farming and augment productivity [2]. Despite of all these efforts of the government, the agricultural productivity and farm household income is still very low in Ethiopia. The major reason behind is mainly the backwardness of the agricultural sector. Using farm technology is enormous for rural households of Ethiopia as land productivity, traditional tools, draft animals and family labor are still the most important factors of production [7].

Even though a positive incremental trends of rural households agricultural production in the last decades in the country, seasonality of farming activity results in unemployment and underemployment for a significant proportion of the rural labor force during most part of the production year. Actually the 2013 national labor force survey indicates that level of unemployment in rural area is only 2% but this figure doesn't include the underemployment rate, CSA [2]. But practically the rural farm activity in Ethiopia is not worked the full year rather the crop season. Rural households are usually engaged in both agriculture and non agricultural activities to averse the risk associated with their family income.

Even though the haramaya district is potential area for cash crop production, the generated income and household level food and nutritional insecurity problem is high [8]. .Most of previous studies are failed to consider which

agricultural productivity (land or labor) is the most determinants of the agricultural farm productivity and rural household income at district level and to identify why smallholder farmers cannot able to identify factors contributing to improvements of farm household income and its diversification. Therefore, this study tries to fill this gap and considering the partial factor productivity measurement to indentify through which the rural household agricultural productivity and rural household income increased in the study area.

2. MATERIALS AND METHODS

In this section, background of the study area, sources of data and methods of data collection, sample size and sampling techniques and methods of data analysis were presented.

2.1. Description of the Study Area

The study was conducted in Oromia National Regional State, East Hararghe Zone, and Haramayaworeda.It is one of the 19 woredas of the east Hararghe zone located at the distance of 508 kms from Addis Ababa and 18 kmsfrom Harar town in the west direction. According to CSA [9] Haramaya district has a total population 271, 394 of which 138,376 are male and 133, 018 are female. A total area of the woreda is about 55 km^2 (55,100) ha, the total cultivated land is 38,497 Ha. The predominant soil types of the district are Rigo soil 60% and a heavy black clay soil (vertisols) 40%. Soil texture is sandy loam. The rain fall of the District is bimodal, erratic and uneven in distribution, the short rain season occurring between the months of February to May and the long rain occurring between the months of June to September. The mean annual rainfall is 492 mm ranging from 118-866 mm, and located at 42^0 30'E, 9^0 26'N.

The woreda has 33 rural kebeles and the major crops grown in the area include sorghum, maize, and haricot bean, wheat, barley, ground nut, potato, onion, Khat and other vegetable crops. The most common cash crops for the district are vegetables and Khat. Livestock are important components of the farming system for consumption and source of income. The livestock rearing is mostly not greater than four herd per household because of shortage of grazing land, the Animal feeding method is most commonly have experienced cut and carry system.

2.2. Sources of Data and Methods of Data Collection

Both primary and secondary data sources will be used. The primary data will be collected using semi-structured questionnaire that will be administered by the trained enumerators. Enumerators recruited are the ones who are capable of speaking the local language as well as English to explain the prepared questionnaire to the respondents using local language. To have a reliable information, pre-test will be conducted and modification made based on the feedback from the pre-test, and then actual data collection will conducted as scheduled. In addition to primary data, secondary data will also be collected from relevant sources such as published and unpublished documents from the agricultural and rural development and water resource development offices of the district and other relevant institutions for general description and to augment primary data.

2.3. Sample Size and Sampling Technique

Among 18 Districts in East Hararghe; Haramaya districts was selected purposively due technology adoption and degree of household level farm productivity. Then after, two rural kebeles were selected purposively due to its potential area for the cultivation of the cereal crops. To select sample respondents from the two kebeles, simple random sampling based on probability proportion to size was employed. Finally, a total of 120 sample respondents; of cereal crop producers were interviewed.

2.4. Methods of Data Analysis

To address the objective of study, this paper employs both descriptive statistics and econometric model.

2.5. Regression Analysis

A linear regression model was run to examine factors affecting differences in households' farm income levels. The mathematical specification of the model is as follows:

$$y_i = a_{0i} + a_{1i}x_{1i} + a_{2i}x_{2i} + \ldots + a_{ni}x_{ni} + e_i$$

Where; y = Amount of farm household gross margin (GM) for each sample households. a_{0i}, a_{1i}, a_{2i} ..., a_{ni} are parameters to be estimated, and $\mathbf{e_i}$is a random disturbance term. $x_{ij}$are independent variables, such as: age, sex and education of HH head, dependency ratio, total cultivated land, soil fertility status, distance from market center, etc. Where gross margin calculated by subtracting total variable cost from the total farm income (total income- total variable cost

3. RESULTS AND DISCUSSION

3.1. Descriptive Results of Continuous Variables

According to the study result, the average family size of the sample households was 6.75 persons, with 2 and 12 being the minimum and the maximum family sizes respectively. The average age of the sample household heads was 41 years where the minimum is 24 years and the maximum was 75 years. Level of education: The average years of formal schooling of the sample farmers was grade 3. The study also showed that the mean livestock holding in Tropical Livestock Unit (TLU) for the sample households was 3.85 in TLU whereas The average family labor consumed by the sample respondents were 373 man days. Further the study indicated that, the average Amounts of chemical fertilizer used by the sample respondents were 2.46 quintals. Whereas the average Amounts of improved seed used by the sample respondents were 1.76 quintals. Finally, Access to market center is a determinant of profitability and sustainability of agricultural produce or proxy to agricultural marketing services and the mean distance between the villages and the market in kilometers for the sample households was found to be 6.1 kilometers.

Table-1. Descriptive Results for Continuous Variables

Variables	Mean	Minimum	Maximum
Age	41	24	75
Family size	6.75	2	12
Education	3.6	0	10
Farming experience	26	9	60
Cultivated land	0.33	0.065	1
Livestock holding	3.85	0	8.949
Labor	373	200	800
Fertilizers	246	25	900
Seeds used	176	75	300
Manures	1600	0	12500
Market distance	6.18	0.5	16
Crop income	26001	2400	103250
Livestock income	5397	0	32400
Off farm income	810	0	12000
Non farm income	11765.6	0	301200
Value of current assets	94052.38	3100	762710
Total income	33982.57	7850	98500
Gross margin	10933.3	44	66820

Sources: Own Survey Result. 2016.

As indicated in the study result, the mean value of sample households' crop income was 26001.5 in birr and the study showed that the mean value of sample households' livestock income was 5397.6 in birr, so the mean value of sample households' farm income was 33982.57 in birr. The study showed that the mean value of sample households' current assets was 94052 in birr with the mean value of sample households' gross margin of 10933.5 birr.

3.2. Descriptive Results of Dummy Variables

According to the survey result, 10.8 percent of the sample households were headed by females and the rest 89.2 percent were headed by male. As result of a Farmers training given by farmers at a farmers training center by different responsible organs to improve the farmers' ability to adopt new technology, crop and animal yield, marketing services, input application and natural and water resource conservations. The study result showed that 47.5 percent of the sample households have used improved seed. The survey results indicated that out of the total respondents, 34.5 percent participated in social organizations and also in the study area soil infertility was not a major problem, the Majority of the respondents said that they do not have soil fertility problem, only 30.8 percent of them reported that their land was either medium or not fertile. Lastly, the study result showed that 67percent of the sample households get extension. While the study result showed that 65 percent of the sample households participated in social organization.

Table-2. Descriptive statics for sample household (discrete variables)

Variables	**Sample Households**		
		Number	**%**
Sex	Male	107	89.2
	Female	13	10.8
Irrigation	Yes	60	50
	No	60	50
Extension	Yes	79	65.8
	No	41	34.2
Imseed	Yes	57	47.5
	No	63	52.5
Soil	Fertile	83	69.2
	Otherwise	37	30.8
Social	Part	44	36.7
	Not	76	63.3
Credit	Yes	33	27.5
	No	87	72.5

Source: Own survey result. 2016.

3.3. Factors Contribute to Farm Households Income Differential

3.4. Determinants of Income Differentials of Households

The household's income differential that measured in their gross margin is determined by different factors. In addition to the descriptions given in different part of this paper, the income analysis in this sub-section was estimated using the multiple linear regression models. The study has tried to address the objective and give empirical evidence for result obtained for regression estimation method.

To avoid the problem of multicollinearity, all explanatory variables defined in Table 1 were checked prior to estimating the regression model. In addition, theoretical relevance was considered to determine the inclusion and exclusion of variables in the model. Following Gujarati [10] multicollinearity problem for all explanatory variables was assessed using a technique of variance inflation factor (VIF) and the test resulted in the rejection of the existence of multicollinearity hypothesis as (mean VIF=2.16). Moreover, heteroscedasticity was tested by using Breusch-Pagan test. This test resulted in rejection of the existence of heteroscedasticity hypothesis as (p= 0.147).

The dependent variable considered in the analysis is the total annual household gross margin derived from agricultural crop income and livestock income on a hectare basis.

Table-3. Linear Regression results for determinates of income differential

Gross margin	Coefficient	Std. Err	T	P>t
Family size	-84.2018	540.129	-0.16	0.876
Age	305.2897*	163.6464	1.87	0.065
Sex	2596.902	3580.484	0.73	0.470
Education	819.5178*	474.6322	1.73	0.087
Cultivated area	14368.64**	6390.555	2.25	0.027
Livestock holding	1679.781***	622.5768	2.70	0.008
Member of institution	383.9071	2319.349	0.17	0.869
Extension	1624.921	2663.005	0.61	0.543
Irrigation	13525.57**	6121.972	2.21	0.029
Market distance	-107.0354	390.3436	-0.27	0.784
Family labor	14.83235	14.32904	1.04	0.303
Fertilizers	3847.395***	924.9647	4.16	0.000
Amount of Seed	-641.6653	390.1334	-1.64	0.103
Soil	-2440.29	1549.474	-1.57	0.118
Constant	-18782.29*	10464.62	-1.79	0.076
Number of obs = 120 R-squared = 0.6919 F(14, 105) = 16.84 Prob> F = 0.0000 Adj R-squared = 0.6508				

Source: Own computation. *,** and *** mean significant at 10%,5% and 1% probability level, respectively

As shown in Table (9), the coefficient of determination and the adjusted R^2 values are 0.69 and 0.65 respectively. It means that about 69% of the variations in the dependent variable explained by the independent variables, indicating relatively high explanatory power of the model.Depending on economic theories and data availability, the variables believed to influence the gross margin of the farming household have been included. Looking into the estimated results, age, cultivated area, livestock holding, irrigation participation of household, and amount of chemical fertilizers are the independent variables explain the farm income differentials. Those variables are explained as follows. Age: Rural households base their livelihoods on agriculture. The older the household head, the more experience he/she has in farming. Moreover, older persons are more risk averters, and mostly they intensify and diversify their production activities. The result of the model indicates that the variable has positive relationship with gross margin of the household. It is significant at 10% level. The coefficient implies that, keeping other factors constant, the farm households gross margin increase by Birr 305 as the age of the household head increase by one year. This result is in agreement with the findings of Tesfaye [11]. Educational level of household head: it was found significant at 10% probability level and positively influence farmers gross margin indicating that relatively more educated farmers recognize the advantages of farm technology than farmers with less educated. This is because of the fact that education enhances farmers' ability to perceive, interpret, and respond to new technology. It also enables farmers to be more aware of the improved technology. Tefera [12]. Reported the same result that education is positively influencing the productivity of farm household. The marginal effect indicated that as education level of household head increased by one year the farm gross margin increased by 8.19%.

Size of cultivated land: Size of cultivated land has positive influence on the farm household's gross margin in the study area. It was significant at 5%. Increase in size of cultivated land has positive relationship with the amount of production to be harvested. Therefore, those farmers who cultivated more become in a better position than those who cultivated less. The coefficient implies that with all other factors kept constant, the farm households gross margin increase by Birr 1468 with increase in size of cultivated land by one hectare.

Livestock holding: this variable is statistically significant at 1 percent probability level. The positive relationship indicates that households with larger livestock holding may have the opportunity to plough at any time with minimum labor cost, especially for oxen. The coefficient of the variable shows that as the household gets one more TLU the farm gross margin of the household increases by Birr 1679.8 and this may lead to improved income from household

farm crop production. This result is in conformity with the finding of Takele [13]. Use of irrigation: it was found significant at 1% probability level. This variable has a positive relation with household gross margin indicating that using irrigation increases the vegetable and non vegetable farm income among the sample households. This might be because of the fact that participation in irrigation would improve agricultural production and productivity. Moreover, farmers can generate higher income from their limited farm land as they tend to produce high value crops through irrigation. This result is consistent with the finding of Abebaw [14] which indicated the negative relation between irrigation water use and food insecurity. The coefficients of gross margin increase by Birr 13525 as households become user of irrigation, citrus paribus. Amounts of chemical fertilizers: Use of fertilizer for crop production plays an important role for production and productivity. In the study area, use of fertilizer is very important input for production of crop. Farm gross margin by its very nature demands high use of improved agricultural inputs like fertilizer in order to produce high value crops like vegetables. In most cases, availability of irrigation encourages farmers to use fertilizer for production of high value crops, which fetches high prices and cover incurred costs. The coefficient showed that all other factors remain constant, the households gross margin increases by Birr 3847 as the households fertilizer use increases by one kilogram.

4. CONCLUSION AND RECOMMENDATIONS

In this study, the factors contribute to smallholder farmers' farm income in terms of gross income in Haramaya district has been assessed using data collected by questionnaire prepared for this purpose. For the study both primary and secondary data were used. The primary data was collected from 120 sample households and the regression model was used to analysis the determinant of farm income differential in the study area. From the result, six covariates were found to influence farm income differential significantly. Livestock holding, irrigation participation, amounts of chemical fertilizer used, cultivated land area, age and education level are significantly influence farm income differentials. Participation to Irrigation has positive relation with gross income indicating users have more total net income than non-participant household. This has an encouraging message for program designers, implementers, and funding agents to take proper action to achieve the intended goals household farm income. Age of the household head has a positive relation with farm income. This is because, the older the household head, the more experience he/she has in farming. Moreover, older persons are more risk averters, and mostly they intensify and diversify their production activities. Educational level of household head was found significant and positively influence farmers gross margin indicating that relatively more educated farmers recognize the advantages of farm technology than farmers with less educated. Whereas Size of cultivated land has positive influence on the farm household's gross margin in the study area. Livestock holding it was found significant and has a positive association with farm household gross margin. This is because livestock contributes towards the family nutritional requirement and complement crop production in such a way that being source of power for ploughing, by providing of manure and for soil productivity. It also serves as accumulations of wealth to be disposed during times of need, especially when food stock in the household deteriorates. The implication of the result was that livestock are an important source of cash in rural areas to allow purchase of farm inputs that can be used. Fertilizer is a major determinant of household farm income differential. The study result indicated that that amount of fertilizer used was found to be positively and significantly influencing the household farm income status. Therefore smallholder farmers need access to improved agricultural technology package such as provision and distribution of improved seed and seedlings, fertilizer, different chemicals, irrigation farm tools (like water pump), etc to enhance their farm income through improve productivity. In addition to the above points government also should emphasize on the expansion of fertilizer and other input distribution centers in rural areas as it may improve farmers' crop productivity and in turn farm income. Generally the policy makers should give do attention to the aforementioned variables to increase farm income of smallholder farmers.

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