Good Governance for Achieving Food Security in Ethiopia: Challenges and Issues

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Abstract

Although rice technologies have been introduced in Fogera district over the last two decades, farm household’s food demand was not met as expected. Sustained, intensified and coordinated rice research is the key to curb the problem but impaired due to lack of good governance coupled with weak institutional capacity. This has resulted snowballing effects like little or no discussion among/with farmers on good practices, successes/failures of technology adoption and input delivery; poor linkage of small farmers to market and knowledge gap in Development Agents. Therefore, this study identified and evaluated potential determinants of household food security with basic emphasis to factors linked to good governance introduced to address the problem of food security in the study area through farm household rice technology adoption. A multistage sampling technique is used to select respondents. To this end, the primary data was gathered from the field survey by administering pre-tested structured and semi-structured questionnaire. Good governance dimensions of food security are evaluated using binary logit model for its comparative mathematical and interpretational simplicity. Farmers’ own perception of rice technology intervention vis-a-vis farm household food security is explored using focus group discussions supplemented by in-depth interviews. This study result would be primarily important in designing policy interventions and good governance strategies ensuring appropriate use of rice technology and tackle food security problems.

Key words: Rice technology, logit model, good governance, food security

Introduction

Ethiopia is one of the most famine-prone countries with a long history of famines and food shortages. Food insecurity among the population is widespread, and most devastatingly, there have been famines that have cost the lives of about a million people. As a result many Ethiopians live in conditions of chronic hunger with both a low average daily energy supply (kcal/capita/day) of 1880 and a very high (44%) prevalence of undernourishment (Adnew, 2004). Poor farmers in Ethiopia, as in other SSA countries, obtain limited benefit from agricultural research despite can generate handsome returns. The dimensions, causes, and consequences of food insecurity differ widely within the country. For instance food insecurity problem in Amhara regional state of Ethiopia is due to combination of factors such as environmental degradation, irregular rainfall, high population pressure, recurrent cycle of drought, lack of diversification in economic activities, and institutional weakness.
However, the typical reason for food insecurity is considering farmers as a homogeneous mass regardless of different resources, problems, opportunities and requirements as a result of applying top-down adoption/diffusion approach. The social inequalities among farming population coming subsequent to the application of the approach has laid difficulty to select appropriate technologies tailor to the demand the resource poor farmers which otherwise favored resource (material, intellectual and social resources) endowed ones (Clark, 2002).

A number of institutions have been attempting to generate and disseminate improved agricultural technologies to smallholders since the end of 1960 such as integrated rural development pilot projects and minimum package programmes. Evaluating the performance of the pilot projects and examining the rate of technologies adoption were focuses of these institutions. However, farmers continued reliance on traditional farming practices/low level of improved agricultural technologies adoption and risks in weather conditions, diseases and pests, shrinkage in size of land holding per household and differences in farmers’ perceptions of risks and profits associated with new technologies, insufficient technical and institutional support facilities such as credit, extension, marketing. These have greatly impeded agricultural sector development and growth and reduced adoption rates among different farmers group and caused low production level in the country (Bezabih and Hadera, 2007).

In response to enormous challenges and barriers to improved production technologies adoption, Ethiopia government recently have tried to put agriculture at the heart of policies to increase food production and promotion of improved production technologies among smallholders via agricultural extension such as through Training and Visit, Participatory. Farmers’ knowledge and experience, across diverse agro-ecologies was shared through demonstration using Training Extension System and Farmer Field School though overlooked (Habtemariam, 2007).

However, the knowledge gap that exists among agricultural expert/Development agents hinders enhancing the diffusion and adoption of technologies. Communication as vital instrument inducing behavioural change faced barrier. This has created gaps to look in to the dynamics involved in the social dimension of technology developments and transfer and kept ensuring linkage and technology transfer activities at a minimum (EARO, 1998).

Such problems were tried to be confronted with formulation of agricultural policies’ with immediate strategic focus and good governance (ADLI, 2001). Strategies were designed to use potential swampy estimated rain-fed area of 13 million hectare for rice production. Of these, 13,054 and 25,238 hectare of highly and moderately suitable areas, respectively, for rice production, were identified Fogera (Endaweke, 2007). Rice in Fogera plain is discovered integrated with the technical support of North Korean experts’ and Tana Beles since more than two decades ago (Getachew, 2000). A good opportunity of rice cultivation in Fogera plain is the availability of huge and cheap rural labor for attainment of high productivity of rice thereby secure employment and food demands of the growing population (MoARD, 2009).
Despite rice cultivation in the country is constrained by limited capacity in rice seed production, multiplication and quality control both at the federal and regional level; poor institutional linkage and coordination among all partners including public, private, NGOs and donors; poor tradition of rice food preparation and consumption, poor knowledge on pre- and post-harvest mechanisms, limited availability and lack of storage facilities (Ibid).

**Statement of the Problem**

In Fogera plain, rice growing received due emphasis and has been adopted in potential suitable swampy agro-ecologies where other food crops do not do in order to increase production and productivity. Besides the efforts have been made to generate and promote technology in potential areas well. Although rice technologies have been introduced since over the last two decades, farm household’s food demand was not met as expected (EIAR, 2011).

Absence of sustained, intensified and coordinated rice research is the key problem which stem from lack of good governance coupled with weak institutional capacity viz., communication barrier among the stakeholders (researcher, extension worker, farmers) and knowledge gap in Development Agents which laid difficulty to transfer and disseminate recommended rain fed rice cultural practice and discuss on good practices, successes/failures and input delivery and market. This letdown creating farmers willingness to adopt recommended rice technologies (e.g. row planting, seed rate, optimal timing of farm activities) as expected (Sewunet, 2005).

Having the research gaps noted above, no effort was made to evaluate influence of factors linked with good governance introduced to tackle problems of food insecurity through farm household rice technology adoption.

**Objectives of the study**

In response to these research gaps outlined, this study objectives are to:

- evaluate potential good governance determinants of household food security introduced to address the problem of food insecurity;
- Discover farmers’ own perception of good governance vis-a-vis farm household food security.

**Conceptual and Theoretical Literatures on Food Security Nexus Good Governance**

Governance is the exercise of political power in the management of nation’s affairs vis-à-vis State’s institutional and structural arrangements, decision-making processes and implementation, and the relationship between the governing apparatus. Basically focuses on building capacity, provision of rural off-farm opportunities for both the landless rural poor and group of non-adopters that fall out of business, facilitating market access, gender sensitive development, nutritional interventions, building on coping strategies, provision of safety nets to vulnerable groups (World Bank Report, 1989).

Good governance is “a system of government based on good leadership, respect for the rule of law and due process, the accountability of the political leadership to the electorate as well
as transparency in the operations of government. Transparency has to do with the leadership carrying out government business in an open, easy to understand and explicit manner, such that the rules made by government, the policies implemented by the government and the results of government activities are easy to verify by the ordinary citizens. Basically governance emphasizes leadership which suggests the way political leaders that are the apparatus of the state, use or misuse power, to promote social and economic development or to engage in those agendas that largely undermine the realization of the good things of life for the people. Good governance is in series with democratic governance. High valued principles characterize good governance such viz, rule of law, accountability, and participation, transparency, human and civil rights. This would capacitate the development process of a country (Odock, 2006).

African continent in general as U.S. Senator Barrack Obama speaks in Nairobi, Kenya, in August 2006, for all the progress that has been made, has not yet created a government that is transparent and accountable, one that serves its people and is free from corruption which undermines the governance process. Indeed Obama noted that:

Governance in Africa is crisis ridden and it is a crisis that is robbing honest people of the opportunities they fought for. Corruption erodes the state from the inside out, sickening the justice system until there is no justice to be found, poisoning the police forces until their presence becomes a source of insecurity rather than a source of security. In the end, if the people cannot trust their government to do the job for which it exists, to protect them and to promote their common welfare, all else is lost.

Caroline Sahley, et al, (2005) assess the link between governance and food security, and considers the different ways state action affects food security. First, there are things the state does that may undermine food security, intentionally or unintentionally. Of these, few are unrelated to food security policy. Discrimination against a certain ethnic group, the percent of budget spent on military, confiscatory land policy, and conflict, are components. Second, there are the governance constraints that limit the effectiveness of state interventions such as safety nets, feeding programs and extension services designed to improve food security. Third, there are sins of omission--what should the state be doing (but isn’t) that contributes to food security?

In Ethiopia, natural disasters as root cause of food availability ceased to be solely adequate rather together with improper governance. This generalization reached after chronology of events leading to the development of the two major famines is analyzed. The major famine incidences in Ethiopia over the last two decades was occurred under two different types of political systems in an absolute monarchy (although with a constitution) up to February 1974, and a totalitarian Marxist regime which lasted up to 1991. Famine had much correspondence with apparent inefficiency resulting in a failure to respond to the drought problem back and forth regimes. The Marxist regime primary motivation following imperial regime was to gain political support through incriminating the preceding monarchical system for crimes against the people perpetrated through the neglect of distress signals and thereby the aggravation of the famine disaster.

Facts of neglect of the interests of the people across regimes lend supported the study hypothesis that issues of governance are in fact critical and decisive variables in the
causation and aggravation of famine conditions. For instance, an absolutist form of "constitutional" monarchy based government does not take the welfare of the people into account (Alston, 1984).

As highlighted in some events about the ways in which the undemocratic governments, that were in power, absence of accountability is identified as primary causal factor in the process leading to the famines. This had contributed to the processes leading to the famines during their respective periods which took place during the feudo-monarchic system /pre-1974 period/as a result of uncertainties by the issues of succession to the throne and the apparent unwillingness of the old monarch to give up power in spite of failing capacity to administer the country. This had led to a situation that encouraged widespread corruptions and abuses of power among the ruling classes and the beurocracy that neglect the public interest and the pursuit of individual enrichment. Events that took place during the 1972/74 famine period in Wollo administrative region of the country vividly illustrated this fact.

Other point illustrative of defective governance is complaint of drought not only to the Afar tribesmen who lodged but also to the Issa tribes-men who carried out the looting. Moreover, reports on the intensity of the drought situation in various districts of the administrative region prompted the regional administrator of Wello at the time to convey the urgent need for relief assistance in writing to the concerned official in the Ministry of Interior in the capital (RRC, 1984).

**Description of the Study Area**

Fogera woreda is one of the 151 woreda with in Amhara National Regional State of Ethiopia. The whole part of Fogera is in the mid high land climatic zone with flat land area covering 117,405ha (76%) with mountain and hills 16,692.8 ha (11%); and valley bottom 20,082.4 ha (13%). It is located within 11°41'13" and 12°02'54" North latitude and 37°29'11" and 37°58'46" East longitude (ANRS-BoFED, 2006).

The total population of the woreda or district is estimated at 140,458 of which 76,762 are males and 63,696 are females. Of the total population, 105,088 are rural households of which 53,896 are males and 51,192 are females. The estimated average family size is 6.97 persons per household larger than the region average family size (5 persons per household). The population density of the study area is 98 persons per km² (FWARDO, 2012).
Fogera Woreda is endowed with diverse natural resources and can grow a number of annual and perennial crops. The dominant soil type is black clay soil (ferric Vertisols). Orthic Luvisols soil type dominated the medium and high altitude areas. Minimum and maximum land holding of a farmer is 0.25 and 3.0 ha, respectively, giving an average land holding size to about 1.4 ha (Ibid).

Fogera plain adjoining Lake Tana is currently one of the most densely populated areas following improvements in health facilities, and reduced spread of malaria disease versus the past where malaria epidemic disease predominated. The area gets silt or sediment comes from the hilly areas. Rain-fed maize, teff, rice constitutes the major agricultural activity. Livestock rearing is a traditional component of the farming systems (FWARDO, 2006).

**Data and Methods**

The data generated for the study were extracted from primary and secondary sources. Cross sectional design was used to obtain data from cross-sectional units. Primary data were collected on monthly expenditure of households on food items and factors of good governance. Data on good governance indicators established to address the problem of food security in the study area through farmers’ adoption of rice technology included farmer’s own perception of land tenure security, farmers distance from Training Center and credit institution, and market, frequency of day contact with DAs in last cropping season, farmer’s own perception of considering women as food producers and income earners, farmer educational status, rice production experience, participation to farmers’ to farmer knowledge sharing, participation in non-farm activities, family size in man equivalent.

Required data were obtained using structured (household Survey questionnaire) and semi-structured interviews (in-depth interviews, focus group discussions), and field observations. A multistage sampling procedure was employed to select study sites and draw farmers’ central to the study (Som, 1966; Cochran, 1977).

The first stage involved purposeful selection of Fogera woreda as most representative of rice producing district in Amhara National Regional State of Ethiopia.
In the second stage, Fogera flood and intermediate plain areas are selected based on adequate representation of rice production areas. The purposeful representation of Fogera plain includes 12 Rural Kebele Administration Units. From these, Kidist Hana, Nabega, Woreta Zuria, Reb Gebriel, Kuhar Abo and Kuhar Michael RKAUs where 15 villages (locally called Gott), were selected using stratified simple random sampling technique. In the last stage, a total of 140 households who all are rice growers were selected using stratified systematic random sampling techniques. From these, 42 were female headed households.

Table 6.1: Sampled RKAUs and Number of Households Selected From Each Sampled RKAUs

<table>
<thead>
<tr>
<th>Sampled RKAUs</th>
<th>Number of HH per RKAU</th>
<th>Number of HHs selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nabega</td>
<td>1582</td>
<td>16</td>
</tr>
<tr>
<td>Kidist Hana</td>
<td>2459</td>
<td>26</td>
</tr>
<tr>
<td>Abua Kokite</td>
<td>1816</td>
<td>24</td>
</tr>
<tr>
<td>Kuhar Michael</td>
<td>1310</td>
<td>21</td>
</tr>
<tr>
<td>Kuhar Abo</td>
<td>1608</td>
<td>18</td>
</tr>
<tr>
<td>Reb Gebriel</td>
<td>3310</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total Households</strong></td>
<td><strong>12,085</strong></td>
<td><strong>140</strong></td>
</tr>
</tbody>
</table>

Source: Computed by the authors, using data from Fogera Woreda (district) agricultural Offices, South Gonder Zone, Amhara Regional state of Ethiopia

The data collected for the study was analyzed using descriptive and inferential statistics. The descriptive statistics include the mean, standard deviation and percentage. The inferential analysis used the logit regression model. The ratio analysis used was used as compute food security index and categorize the sampled households into food secured and food insecure groups. Therefore, a household is considered as food secured if attained at least two – third of the average food expenditure of the sampled households otherwise the household is considered food insecure (Omonona and Agoi, 2007)

\[
F_1 = \frac{\text{per capita Food Expenditure for the Household}}{\frac{2}{3} \text{mean per capita Food Expenditure of all Household}}
\]

Where \(F_1\) = food security index, When, \(F_1 \geq 1\), the household is food secure; and, \(F_1 < 1\), the household is not food secure.

**Selection of Appropriate Econometric Model**

The predicted probability of household food security confirmed through logit versus probit provide a logistic distribution function. It is employed for its simplicity of estimation and interpretation of parameters (Gujarati, 2003). Hence, it is opted to analyse potential determinants of household food security with basic emphasis to factors linked to good governance.
Therefore, households’ food security determinants were examined by the model as:

\[ P_i = \frac{1}{1 + e^{ \beta_0 + \beta_1 X_1 + \cdots + \beta_k X_k}} \]

Where,

- \( P_i \) is the probability of food security occur;
- \( \beta_0 \) is the constant term;
- \( \beta_i \) (i=1, 2, ...,k) are regression parameters to be estimated;
- \( X_i \) (i=1,2,....k) are independent variables; and i\(^{th}\) observation

Let \( Z_i = \beta_0 + \sum \beta_k X_k \)

Then \( P_i = \frac{1}{1 + e^{Z_i}} \)

The model is estimated through maximum likelihood estimation procedure.

Qualitative data was gathered to supplement the quantitative data collected by the household sample survey using Focused Group Discussion and Key Informants Interview. Focus group Discussion was held with four groups in four RKAUs. Each group consisted of 6-8 persons, and the composition of the groups included elders, women and the youth as better means to gather data across their diverse social, economic and cultural setting such as agricultural inputs provision, marketing functions and problems, etc. at community level.

Key Informant Interview was made mainly with farmers. Farmers’ opinion was harmonized by views of officials and experts from Fogera Woreda Agriculture and Rural Development and Woreda DPPD and Food Security Offices. Likewise, discussion was complemented by agricultural experts and representatives of the local cooperative union who worked in rice marketing.

**Results and Discussions**

Based on the results of the analysis on household food expenditure, 40% of the households spend between 2001.00-4000.00 ETB on food. Over 37 and 8.57 percent of the households spent 2000.00 ETB or less and between 4001.00 to 6000.00 ETB on food, respectively. 7.14% of the households spend above 8000.00 ETB on food per month.

<table>
<thead>
<tr>
<th>Expenditure on food (ETB)</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \leq 2,000.00 )</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>2001.00 - 4,000.00</td>
<td>52</td>
<td>40</td>
</tr>
<tr>
<td>4001.00-6,000.00</td>
<td>38</td>
<td>37.14</td>
</tr>
<tr>
<td>6001.00 - 8,000.00</td>
<td>12</td>
<td>8.57</td>
</tr>
<tr>
<td>( \geq 8001.00 )</td>
<td>10</td>
<td>7.14</td>
</tr>
</tbody>
</table>

Mean Food Expenditure = 4,905.00 ETB; SD =1,466.00 Minimum =1850.00 and Maximum =8,505.00

Source: Field Survey, 2014

**Descriptive Statistics of Variables**
Descriptive statistics of both dependent variable and independent variables (mean and Standard deviation) in the model are presented in the table below.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description of variables</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSS</td>
<td>Food Security Status, 1=food secured HH, 0 otherwise)</td>
<td>0.43</td>
<td>0.49</td>
</tr>
<tr>
<td>H_EDUC</td>
<td>Farmer educational status, 1 if read and write, 0 otherwise</td>
<td>0.53</td>
<td>0.5</td>
</tr>
<tr>
<td>S_HH</td>
<td>Household head Sex, 1 if male, 0 otherwise (i.e. Binary)</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>REXP</td>
<td>HH’s rice production Experience in ( year)</td>
<td>25.4</td>
<td>9.4</td>
</tr>
<tr>
<td>RRT</td>
<td>Riskiness of Rice Technology, 1= if risky &amp; 0 otherwise</td>
<td>0.47</td>
<td>0.5</td>
</tr>
<tr>
<td>FAMLOB</td>
<td>Total family size of HHs in man equivalent (ME)</td>
<td>3.7</td>
<td>1.44</td>
</tr>
<tr>
<td>TLLU</td>
<td>Total Livestock Unit</td>
<td>11.48</td>
<td>3.75</td>
</tr>
<tr>
<td>H_FINCM</td>
<td>Household Farm Income in ETB</td>
<td>4,905</td>
<td>1,466</td>
</tr>
<tr>
<td>LANDSZ</td>
<td>Total Land Size Cultivated</td>
<td>2.13</td>
<td>0.84</td>
</tr>
<tr>
<td>FOPLTS</td>
<td>Farmer’s own perception of land tenure security 1 if farmer perceive land security is influential to secure food &amp; 0 otherwise</td>
<td>0.31</td>
<td>0.46</td>
</tr>
<tr>
<td>PFFK</td>
<td>Farmers participation to farmers’ to farmer knowledge sharing</td>
<td>0.49</td>
<td>0.52</td>
</tr>
<tr>
<td>FPAESP</td>
<td>Farmer overall perception of agricultural extension service provision across his/her farming experience =1, &amp; 0 otherwise</td>
<td>0.33</td>
<td>0.47</td>
</tr>
<tr>
<td>FDTC</td>
<td>Farmers distance from Training Center</td>
<td>45</td>
<td>23</td>
</tr>
<tr>
<td>FDCI</td>
<td>Residence distance from formal credit institution (km)</td>
<td>35</td>
<td>19</td>
</tr>
<tr>
<td>RTADS</td>
<td>Rice technology adoption decision status, 1 if farmer adopted, &amp; 0 otherwise</td>
<td>0.20</td>
<td>0.40</td>
</tr>
<tr>
<td>PNFA</td>
<td>Participation in non-farm activities</td>
<td>0.51</td>
<td>0.50</td>
</tr>
<tr>
<td>MCDIST</td>
<td>Distance to market center in KM</td>
<td>12.6</td>
<td>8.03</td>
</tr>
<tr>
<td>FRECD</td>
<td>Frequency of day contact with DAs in last cropping season</td>
<td>13.5</td>
<td>4.7</td>
</tr>
<tr>
<td>FoPESfW</td>
<td>Farmer’s own perception of considering women as food producers &amp; income earners, 1= if farmer perceived women as noted &amp; 0 otherwise</td>
<td>0.67</td>
<td>0.47</td>
</tr>
</tbody>
</table>

### Empirical Results of the Household Survey

The maximum likelihood estimation of the parameters were employed as measures of goodness of fits to check and validate that the model fits the data. Explanatory variables were checked for existence of multicollinearity and the degree of association. Accordingly, a technique of Variance Inflation Factor (VIF) was employed to detect the problem of multicollinearity among continuous variables. Contingency coefficients used to check the degree of association among the dummy variables. It was concluded that there were no multicollinearity and association problems between a set of continuous and discrete variables, as the respective coefficients were very low (less than 10 for continuous variables and less than 0.75 for dummy variables) (Appendix Table 1 and 2).

Another measure of goodness of fit of the model is based on a scheme that classifies the predicted value of events as one if the estimated probability of an event is equal or greater than 0.5 and 0, otherwise. The results show that about 93.1% of food secured and 92.68...
% of food insecure were corrected by the model. Generally the model correctly predicted 92.86% of the overall sample households’ vis-à-vis factor of good governance.

Out of eighteen explanatory variables included in the model, nine were found to be significant in influencing farmers’ food security status of household at 1, 5 and 10% significant levels. Of these, four are dummy variables having direct and influence at 1 and 5 % level of significance are, respectively, are household’s educational level, and sex, and farmers’ own perception of land tenure security and farmers consideration of women as food producers and income earners. Continuous variables having direct influence on food security status of the household at 5 and 10% levels of significance were respectively, farmer’s rice crop production experience, household farm income; and family labor supply in ME and total livestock in TLU.

**Table 7.3: Maximum Likelihood Estimate of Logit Model Results for Food Security Determinants**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Std. Err.</th>
<th>Odds Ratio</th>
<th>t- ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>H_EDUC</td>
<td>2.891</td>
<td>0.905</td>
<td>18.013</td>
<td><strong>3.20</strong>*</td>
</tr>
<tr>
<td>S_HH</td>
<td>3.526</td>
<td>1.213</td>
<td>33.992</td>
<td><strong>2.91</strong></td>
</tr>
<tr>
<td>RPEXP</td>
<td>0.103</td>
<td>0.051</td>
<td>1.1091</td>
<td><strong>2.00</strong></td>
</tr>
<tr>
<td>RRT</td>
<td>-0.075</td>
<td>0.909</td>
<td>0.927</td>
<td>-0.08</td>
</tr>
<tr>
<td>LANDSZ</td>
<td>0.585</td>
<td>0.326</td>
<td>1.795</td>
<td><strong>1.79</strong></td>
</tr>
<tr>
<td>TTLU</td>
<td>0.248</td>
<td>0.128</td>
<td>1.282</td>
<td><strong>1.94</strong></td>
</tr>
<tr>
<td>H_FINCOM</td>
<td>0.0003</td>
<td>0.00012</td>
<td>1.0003</td>
<td><strong>2.40</strong></td>
</tr>
<tr>
<td>FAMLOB</td>
<td>0.429</td>
<td>0.498</td>
<td>1.5361</td>
<td>0.86</td>
</tr>
<tr>
<td>FOPLTS</td>
<td>2.382</td>
<td>1.034</td>
<td>10.833</td>
<td><strong>2.30</strong></td>
</tr>
<tr>
<td>FFKS</td>
<td>-0.373</td>
<td>0.819</td>
<td>0.688</td>
<td>-0.46</td>
</tr>
<tr>
<td>FOPAESP</td>
<td>0.269</td>
<td>0.784</td>
<td>1.309</td>
<td>0.34</td>
</tr>
<tr>
<td>FDCT</td>
<td>-1.341</td>
<td>1.064</td>
<td>0.261</td>
<td>-1.26</td>
</tr>
<tr>
<td>FDIR</td>
<td>-0.603</td>
<td>0.854</td>
<td>0.547</td>
<td>-0.71</td>
</tr>
<tr>
<td>FRTADS</td>
<td>0.558</td>
<td>1.186</td>
<td>1.7481</td>
<td>0.47</td>
</tr>
<tr>
<td>PNFA</td>
<td>0.560</td>
<td>0.890</td>
<td>1.752</td>
<td>0.63</td>
</tr>
<tr>
<td>MCDIST</td>
<td>-0.121</td>
<td>0.059</td>
<td>0.885</td>
<td><strong>-2.03</strong></td>
</tr>
<tr>
<td>FRECD</td>
<td>0.223</td>
<td>0.276</td>
<td>1.250</td>
<td>0.81</td>
</tr>
<tr>
<td>FoPESiW</td>
<td>2.027</td>
<td>0.899</td>
<td>7.592</td>
<td><strong>2.25</strong></td>
</tr>
</tbody>
</table>

Observation = 140, food secured are 60 (42.85%) and food insecure are 80 (57.15%)
Number of observation 140
LR chi² (18) 125.05***
Prob > chi² 0.000
Log likelihood -33.7748
Over all model prediction (%) 92.86
Over all prediction of Food Secured Households 93.10
Over all prediction non Food Secured Households 92.68

***, ** and * significant 1%, 5% and 10% level, respectively
Source: Model results (2014)

http://scholarworks.wmich.edu/ijad/
The odds-ratio in favor of being food secured, other factors kept constant, increases by a factor of 34 with the change in sex of the head from female to male. This may be due to relatively better access of male-headed households to information and agricultural resources than females’ household heads.

The odds-ratio in favor of being food secured, other factors kept constant increases by a factor of 18.1 for the farmer whom assumed household heads become literate than that who did not. This implies that the educated farmers are more likely to be food secured than those who are not educated. This may be due to relatively educated farmers have more access to information and they become aware to new technology, and this awareness enhances the adoption of technologies.

Food secured household increased by a factor of 1.1 as farmer’s rice crop production experience increases by one year implying farmers who have relatively longer years of experience, may develop the confidence in handling the risk, skills in technology application.

The odds-ratio in favor of household being secured decreases by a factor of 0.88 as the market distance increase by one kilometer. This implies that the longer the distance between farmers’ residence and the market center, the lower was be the probability of being food secured as transport and transaction costs reduce income obtained from marketing.

The odds-ratio in favor of household being secured increased by a factor of 7.5 as farmer’s perceive women as food producers and income earners odds-ratio increased, by keeping other factors constant. Food security of the household increased by a factor of 1.0003 as farm household’s income increased by one unit of Ethiopia birr. This may be due to farmer more ability to afford money to buy agricultural input to improve agricultural productivity with increased farm income.

The odds-ratio in favor of being food secured, other factors kept constant increases by a factor of 1.3 as a result of increment of livestock by one TLU as having more livestock serve as asset base to insure any risk associated with household food security and buy improved agricultural input viz., improved rice seed, fertilizer, farm implements.

An appropriate and effective extension services can encourage farmers to use rice technologies to boost their production and productivity. However, farmer’s overall Perception of Agricultural Extension Service Provision (FoPES), farmer’s frequency of day contact with DAs in last cropping season (FRECD) and participation in non-farm activities (PNFA) as factors of good governance didn’t have impact on household food security.

Rice technology adoption decision (RTADS) didn’t have impact on food security of the farm household. Limitations of rice technology adoption may be due to improper implementation of rice technology adoption resulted from knowledge gap of agricultural extension personnel and farmers infrequent contact with DAs or low attention of farmer to agricultural extension provision for knowledge of agricultural technology.
Good Governance Intervention Nexus Food Security in Fogera: Farmers’ Perception

Based on the 1975 land reform proclamation, rural kebeles in the form of kebele peasant associations were established in all areas including Fogera Plain. Land was distributed to peasants in the hilly Fogera, Fartha, Libo Kemekem and Dera hilly areas during the land reform. As a result, the place called Yezelan Marefia is converted to farmland and settlement. This had brought complications to transhumant cattle herder of Fogera plain to use the communal grazing land as usual. Moreover, one of the local men in Nabega who was involved in FGD gives his own remark about the situation as follows:

Due to the 1975 land confiscation in neighboring hilly areas, plowing outside the residential kebele and use of communal grazing land were forbidden by the Derg regime. Moreover, responsibility was given to the owner of land to protect and keep their land including the communal grazing land from the outsider. All this condition has frustrated and frightened cattle herder to use communal grazing land as usual.

As a result, 65 years old informants from Nabega RKAU told the adverse consequence as:
Since the RKAUs leader in hilly areas didn’t had willing for us to stay in their residential kebeles following land reform, we most of us had stopped to go to hilly areas. The areas to which we used to move with our cattle in the form of transhumance such as eastern side of Amora Gedel, Dagore land along the road through Enfraz to Gondar through places of Wusha Tiris, and Yifag town, were given by the government to some Muslim and Christian missionaries, Azmariwoch and Fakiwoch. As a result, lands used for grazing purpose were used for farmland and settlement.

Similarly, most of the key informants and focus group discussants confirmed that:
Transhumant way of life was abandoned following the land reform and mainly after the 1997 land redistribution. As a result, place called Yeguzo Marefia including fallow lands used as grazing were transferred to peasants, and eventually the transhumant has stopped going to hilly areas.

A 68 years old informant from Woreta Zuria RKAUs further explained the issue in such a way:
RKAUs’ leaders agitated peasants to keep and protect the land under them and communal one from the outsiders. Such condition enforced us not to stay in their local residential places. In general the conditions lead us to frighten and remained suspicious as before. Among the key informant who was chika Shum during the period of Haile Selassie and representative of Gondar Awraja peasant association explained the condition as follows: As government measure to solve the shortages of grazing land during wet season, transhumants were paying Yesar Chew to the peasant of hilly areas to use their grazing lands.

http://scholarworks.wmich.edu/ijad/
The land redistribution of 1997 disowns beurocrats grazing land and distributed to the female headed households and supporters of EPRDF party. Such adverse conditions further reduced the size of grazing land found in uplands and plain areas, and therefore this has had counter to the last form of transhumance. Moreover, lack of adequate protection to common pasture has created conducive conditions for farmers to plow the communal grazing land by way of Dinber gifi. Consequently, transhumant were forced to stop leaving their cattle in upland, and finally establish individual enclosure and feed rice crop residual and grass hay in their residential kebeles as last alternative to keep and feed their heads of cattle.

A 68 years old informant from Avia Twah RKAU said:

A decline in availability of grass for cattle brought response of carelessness and refraining to protect and take care of our cattle. Moreover, because of reduced size of grazing land we were obliged to graze our cattle by mixing with other species of cattle. This means that it was difficult to keep our cattle separately and as a result it has interbred pure Fogera cattle with other species of cattle and reduced their number having high economic importance.

The study conducted in the National Institute of Biodiversity and Conservation by Zewdu (2004) has confirmed that pure Fogera cattle breeds have declined from 800,000 in 1981 to 636,000 in 1998. He also noted the reduction of Fogera species found in Dera and Fogera Woreda, along the road from Gondar to Addis Zemen in to 15,000. This is largely due to termination of transhumance movement in early 1991 which has exposed cattle to stay in their marshy and flood areas locality during main rain season where suitable to parasite worms and for disease causing agents for deaths of Fogera cattle breeds over time.

These adverse conditions have attracted the attention of government and some individuals to introduce rice cultivation in the area since. Based on trial experiments Olongistimate rice species was identified and found better fitting to agro-ecologic setting of the area and started to be cultivated in areas of within the Fogera plain of Tana depression.

The information obtained from one key informant who participated in Ethio-Korea project in 1984 and 1985 who was chairman of Jigna RKAUs in Neighboring Dera district noted:

There was big effort to introduce rice during the time of drought in different parts of the country. The role players were Dera woreda producer cooperatives, experts from Ministry of Agriculture and North Korean project. The aim of this project was to encourage peasants adopt rice technology, vegetables and maize production in the area using improved technologies, irrigation and chemical fertilizer.

In context with this, one of the key informants from Kidist Hana RKAU told that:

People in the area or outside including urban people showed no interest to use rice for food. They were reluctant for the first time, to use rice as source of food. Some used to throw it away and dump it. This was the case in 1984/85.
How could men consume grass seed! Rice is a special grass, Zurha which is introduced by the government. Thus, I never grew no grass of this type in my farm and did not eat it. It couldn’t satisfy the food need of my stomach. Those who ate rice were thought weak, gray and it caused constipation. I consider it was not good for health.

Similarly, one of the key informants employed in a cooperative association shop told:

Rice was adopted as food in Ethiopia by act of government pressure. Since rice is an exotic crop, Ethiopians were not familiar with and interested it to feed. Opposition was tied with their local environmental natural condition. How can this it as Zurha grass as well as growing in swampy land could be useful for human being as food! How on earth such grass like growing on water could be called as a crop! As a result, we cooperative shop sellers used to sell rice to those who did not have Rashen card were compelled to buy rice with commodities. In doing this, we were selling 5k.g of rice by compulsion together with other commodities that had more demand to customers.

In response to these challenges, one of the officials of EPRDF noted that

Although there was resistance to adopt rice, with strong emphasis given by the Amhara regional government in coordination with South Gondar zone and Fogera Woreda Agricultural Office in line with attaining the principle of food self-sufficiency, the cultivation of rice was resumed and people started producing it since 1993/94. Rice was formerly collected by the woreda agricultural workers from the Jigna cooperative farmers who were pioneer to produce on small plots of land which then immediately introduce and spread to farmers of Avua Kokite and Nabega in the year 1993/94.

Also zonal and district government agricultural experts involved as discussant gives their own remark about the situation as follows:

Fogeres gradually accepted and attracted to sedentary rain fed rice based agriculture as livelihood base strategy in response to challenges facing to restriction of termination of transhumance way of life.

With all the above dilemmas that transhumant cattle herder faced that many of the discussant and key informant interviewees concluded as:

Forced withdrawal of transhumant way of cattle management has adversely affected major sources of livelihood, i.e. our cattle resources which has never been compensated till now by cultivating rice and irrigation agriculture. Of course, we can’t deny that if we continued cultivating traditional crop than growing rice for its higher productivity nature, the problem of sustaining our food for consumption could be more severe.

http://scholarworks.wmich.edu/ijad/
Use of swampy land dominating Fogera plan since the recent past for rice farming has been used at the expense of communal grazing land. The grazing land was much larger than the land used under crop. A 67 years elderly person (informant) form Na Bega used the following expression which reminds grazing land was in plenty. He told that:

Once upon a time, when many Derge soldiers came to Fogera plain, there was shortage of food at that time. When the soldiers asked people of the area to give them food to eat, there was none to give them. Hence, the inhabitants articulated saying let you “take the grass to eat”. This was the time where we transhumant cattle herder faced food shortage for the first forced to stay in original locality floody containing cattle disease causing parasitic worms and transformed in to sedentary rain fed rice based agriculture.

Having said by discussant and in-depth interviewees issuing land as cross cutting issue, Fogeres business in previous times since over 5 decades ago, were serving as means of preserving their cattle through transhumant way of cattle management across imperial and partly in Derge regimes through preserving communal grazing land for cattle feeding in and outside their locality. Following termination of transhumant way of cattle management as an essential feature of agricultural practice in the area, large size of swampy land previously used as communal grazing land during winter season, has been serving for sedentary rain fed rice based agriculture.

Transformation of Fogeres source of securing household food demand in to sedentary rain fed rice based agriculture is done through combined effect of zonal and woreda administrative structures for providing advises to the Fogeres and provision of training and orientation seminars for development agents, peasants and KPRAU’s leaders and political cadres to raise awareness and transfer the skill and land use technology of rice cultivation and its high productivity. Farmers were selected based on their good will and participation in extension package program locally as “model farmer” to orient with government policy program, strategy and guides and regulations. Training was given to such personalities based on local development organization consisting of 4-10 peasants serving as mediators to orient development agitation and giving reports to KPRAU”s development agents.

They were learned and trained in the amount of seed sawn in a given unit plot of land how to protect the weed and maintain or keep the moisture level of the soil, etc, and how to prepare different types of food from rice flour via home economics expert by involving some model women. Now a day, most farmers have become motivated to grow rice as a food crop, and rice has become essential part of food and cultivation culture of the people in the area.

Recently as most Woreda and KPRAU agricultural experts argue, use of land for rice cropping increased in Fogera Plain. Fogeres rational was for its high yield, resistance to disease, and the possibility of multiple cropping in a year and its adaptation to swampy ecology, relative high market price and thatching of huts and to feed livestock. The outcome of high market price of rice in urban and rural markets has promoted the economic status and the livelihood of peasants better than other type of crops. Its higher yield and its multiple utilitarian values as compared
to other type of crop encouraged Fogeres to devote more swampy lands to rice cultivation than ever before. Despite growing rice has comparative advantage, all agricultural experts taking part in Focus Group Discussion from Fogera Woreda Agricultural office claimed:

The local and regional government didn’t pay due attention to alleviate defects in rice milling machine planted in Woreta Town. It has created loss of not less than 40-45 percent of rice after unrefined rice entered in to rice milling machine that before being consumed by the household. The machine created more breakage which has reduced the quality of rice. Moreover, the poor handling /traditional/ crop storage system locally made of bins called “Gottera or Gota” made of bamboo tree plastered with mud has exacerbated post-harvest losses.

Similarly most of farmer taking part in in-depth interviewing and focus Group discussion has confirmed that

Nearly 1/3rd of rice crop produced is or will be lost during rice milling process. This has reduced our amount rice. Government didn’t take action to alleviate rice milling machine defect. The cooperative we involved as member also didn’t want to intervene to bring solution to the problem. As the rice milling machine creates more rice breakage and owner steals this broken rice. They sold it for cattle feeding and earn more income than a rice cultivator farmer get income from rice. Moreover, the broken rice reduced the quality of rice as compared to imported ones. We claim problem of machine to government regularly though we still didn’t get solution. Moreover, spoilage during harvesting, hulling and threshing problems all together reduces the quality of rice in the market upon its selling price. Besides, we farmer have no awareness about the benefit of the specialty market and hence to produce in line with taste and preference of consumers demand and only for immediate economic advantages from the sale of their product.

As a result a 40 years old informant from Kuhar Michael RKAU explained his rational of cultivating maize as opposed to rice as:

I prefer to produce maize rather than growing rice because of post-harvest loss during processing it using milling machine. Maize is useful for immediate consumption or used for food at ripening stage. The productions obtained from maize were 36 quintals per hectare which is better than producing rice facing more loss as a result of processing rice. Hence, comparatively I prefer to produce maize than rice.

The desire to create and maintain a collaborative working relationship between researchers, extension agents and farmers is vital. However, focus group discussants has confirmed that

We ourselves and other farmers in our locality are not that much interested to take part in Research-Extension-Farmer linkage activities.
It is because our problems are not clearly and carefully well known. Researcher and extension staffs simply said ‘do this’ and don’t do that’ though we have rich indigenous knowledge sources. Also there are successful stories among us that could be disseminated and transferred to other farmers. Despite, we have vital information (local), to enhance the development, acceptability and utilization of technologies. One of our colleagues history who were involved as functional member in linkage activities researcher from MEDA taking part in rice Development, was consulted to use improved rice seed locally known as ‘Edget’ in place where highly swampy. However, he was not fruitful even he earned lower than the production obtained from traditional based rice farming. Consequently, this farmer was claiming and forced to take the issue to the court though the issue still suspended by the court officials.

Two of the focus group discussant and most in-depth interviewees have pointed out lack of interest in linkage activity is because

Researcher and extension worker have little or no discussion with us to be familiar with our success and failures. As a result, we were not chanceful to transfer successes in agricultural technology adoption in to other areas and evaluate gaps in input delivery and implementation of agricultural technology adoption.

The above issue is confirmed by all focus group discussants of agricultural experts taking part in research–Extension–Farmers linkage activities as:

Farmers’ participation in linkage activities is minimal. There was infrequent contact among researchers, extension agents and farmers. Gaps in contact didn’t provide adequate opportunity to get feedback/information/ from farmers. This has hindered the flow of generated rice technology in one hand, and rejected other practices of farmers. Formal training of technology transfer to farmers by researchers, is not in a wide spread practice.

All these shortcomings has eroded farmer trust and strained to remain as passive participant. This in turn has made no difference in the production/productivity achievement and net profits versus other farmers didn’t participate in linkage activities.
Summary and Policy Conclusions

Summary of the Key Findings

This study identified and examined factors of good governance introduced to address household food security in the course of rice technology adoption viz., household educational status, distance to market center, farmers to farmers’ knowledge sharing, farmer’s own perception of considering women as food producers and income earners, farmer’s own perception of land tenure security across their farming experience, participation in non-farm activities and so on.

Household’s time spent on Rice Production (RPEXP) have significant and direct influence on household’s food security. Thus, it is important for researcher, extension organization and NGOs to target experienced farmers during on farm research and improved rice technology promotion as they can easily understand about the technology which, in turn helps for convincing the other to adopt the technology and secure household food.

Sex of the household head was found to be positively and significantly influencing household food security. This implies male-headed households were food secured than female-headed households, because female-headed households have less access to improved technologies, land and information than male headed household that helps to adopt agricultural technology. Thus, extension organization, NGOs and private sectors should empower women farmers through access to financial capital and training.

Distance from market center obviously increases transportation and other transaction costs related to the sale of farm output and acquisition of critical inputs that would reduce farmers incentives to engaged in agricultural production activities using improve technologies. While the present effort of the government to extend the construction of whether road in rural areas is encouraging, improving the existing market center in the locality (which is informal and poor developed) should be given proper attention to improve food security.

Education was found to be positively and significantly influencing farmer’s household food security. Agricultural technology could, thus, be facilitated and transferred through educated farmers to contact farmers, besides improving farmers’ level of education. However, farmer to farmers’ knowledge sharing didn’t have impact on household food security status. This may stem from knowledge gap of Development Agent with familiarity of rice technology as an input for others farmers and neighbors share knowledge to improve productivity and household’s food security.

Household’s total farm income has a positive and significant relationship (at 10 percent level) with probability of household’s being food secured. The odds ratio 1.0 implies that, other things being constant, the odds ratio in favor of being food secured increases by a factor of 1.0003 as household’s total farm income increase by one unit of Ethiopia birr. This implies that a farmer who has more farm income is more likely to be food secured.

Distance to market center negatively and significantly (at 5% level) affected the food security status of the farm household. It is because of the distance to travel to sell their agricultural production.
products, to purchase other food items and the reasonability of price for their product matter most for the rural household to get the benefit they want.

Farmer’s own perception of considering women as food producers and income earners positively and significantly (at 5% level) influenced the food security of the farm household. This might have its own implication that spouse be authoritative in resources owned commonly and produces and earns income from it to secure food for family members.

In transhumant way of cattle herding and following sedentary rain fed rice based farming system, household food security remain influenced by farm household perception of land tenure security and total land size cultivated. For instance, farmer’s own perception of land tenure security based on MLE Logit Model results found to be positively and significantly (at 10% level) influencing farmer’s household food security as this may be a good opportunity for farmers to properly manage and protect their farm plot with their willingness to invest household can better sustain their agriculture and produce. Similarly, primary cause for abandonment of transhumant way of cattle management as confirmed by discussants and in-depth interviewees was reduction of communal grazing in and out of their locality following resettlement of Wollo and South eastern Gondar provinces people who were drought affected in the 1960s.

While other determinants of good governance that are farmer’s overall perception of agricultural extension service provision across regimes and frequency of day contact with DAs in the last cropping season remained, with no impact on household food security. This may be due to some weakness of extension agents in areas such as inadequate frequency of contact with farmers and inadequate communication skills and knowledge of adult learning principles. One can also guess due to lack of farmers’ trust to agricultural extension service provision overtime and low level of agricultural information exchange in time of farmers’ contact with extension personnel, respectively.

Policy Conclusions

The development of agricultural technology plays a vital role in increasing production. Policy implications of this study based on the results of the binary logit model and farmers’ opinion aimed at improving households’ food security in the future good governance strategies are as followed. Cattle ownership was influential for farm household’s food security before and after Fogeres abandoning transhumant way of cattle management.

The shift of Fogeres in to sedentary rain fed rice based agriculture has created adverse condition to stay in their original locality in rainy and flood condition containing cattle disease causing parasitic worms with their Fogera cattle breeds. This has reduced the number of pure Fogera cattle breeds. Therefore, these breeds having economic importance has to be preserved by the government and research institutions to supplement food security improvement efforts through household rice technology adoption. This could be by separating it from the owners, traditional breeders of the cattle and their locality, which caused the deterioration of the genetic quality of pure Fogera breed. In doing so, the government together with the responsible bodies has to promote the economic importance of the cattle breeds to other parts of the region. The cattle
breeding station has to be increased in sufficient number so as to multiply and sell the products for those users, together with orienting the mechanisms by which these pure breeds can be kept and preserved.

Farmers’ rice technology adoption decision didn’t have impact on farmer food security status. Probably rice technology was either not properly implemented among the rice farming population which may arise due to knowledge gaps or failures of agricultural development agents to disseminate and transfer appropriate knowledge of agricultural/rice technology to farmers and/or either poor handling of post-harvest mechanisms. Therefore, government should impart extensive in-service agricultural trainings to train the extension personnel to cope up problems in imparting knowledge of rice technology to farmers. Government should also impart trainings and refresher courses to train the Extension Field Staff (EFS) about the philosophy and methodology of agricultural/rice technology. Effective and efficient evaluation mechanism should be launched to monitor and evaluate the activities of EFS and their performance.

Though cultivating rice is a good opportunity to use swampy/wet land, post-harvest loss such as during rice processing using milling machine. This is a challenge to rice growers as it reduces considerable amount of rice together with crop cover. Recently, farm land is highly fragmented following population pressure created in and outside their locality. This has minimized individual farmland owned up to 0.25 hectare. Family size is one of the significant demographic variables that may affect volume of supply. Hence limited production with extended family size would have been difficult for the farmers secure households food in the present and the coming years. On the one hand with small sized land ownership, the farmer would not be economical to adopt rice technology rather be more risk taker than farmer owned large farm land size. Therefore, population growth should be regulated in the future through intervention of integrating family planning with health extension service and with respective concerned bodies.

Communication skills and knowledge of adult learning should be strengthened. This could engage agricultural extension agents with their full potentials of their effectiveness for farmers and make farmers confident to agricultural extension service provision. Therefore, policy makers and other development partners involved in agricultural development have to give due attention to the provision of more effective agricultural services.

Moreover, intensive effort should be done to update the theoretical and practical knowledge of the extension personnel through in service training.

Research, extension, and relevant actors must identify the systems linkage needs and choose agreed-up on mechanisms. Potential governance gaps need to be identified, alternative solutions need to be evaluated and designed, and selecting and implementing the best appropriate mechanisms and constant evaluation is needed. Therefore, farmers must be participated in planning and review; executions of collaborative tasks; exchange of resources, knowledge and information; and joint evaluation and feedback of agricultural innovations. To this end, provisions of quality and quantity of human, physical and financial resources coupled with better incentive mechanisms to research and extension in line with the mandate and mission should be emphasized.
Moreover, both researcher and extension personnel should enhance special units, such as research-extension liaison positions, which specifically in charge of linkages, to ensure appropriate level of integration and effective operation of the technology systems.

All the actors, from policy makers to grassroots-level agents, need to be made aware that research-extension-farmers linkages are important and their participation is crucial to the effectiveness of the agricultural system. Participation in linkage activities in one hand is for demand-driven, multiple-stakeholder, group-based agricultural technology generation and transfer system in the other hand. In a nut shell, a responsible body, with a transparent, accountable, and agreed-upon linkage policies and mechanisms, that monitors and evaluates the action of research and extension is needed and pre-requisite for the country’s overall agricultural development strategy.

Therefore, linkage strength among researchers, extension agents and farmers be established and improved upon. This would help farmers relate freely with researchers and extension agents, thereby improve the bottom-top approach system of communication. Moreover, close linkage and cooperation among extension agencies and research institutes, input, credits and marketing need to be developed to provide farmers with efficient services and access feedback to research institutes and bring solution back to farmers.

Attention should be paid to improve quality of rice so as to satisfy consumer’s desire, and farmer’s market price return. Therefore, agricultural and rural development officers and stakeholders have to create awareness about the specialty of market. In this regard, cooperatives should be strengthened to play important role in improving the bargaining position of the producers and lowering transaction costs, reducing the level of oligopolistic market type by creating competitive market. Moreover, continuous education and training has to be provided to farmers as it has a positive impact on their attitudes and hence on their production and marketing as well.
References


IPMS. (2005). *Fogera pilot learning woreda diagnosis and program design.*


## Appendices

**Appendix Table 1**: Variable inflation factor (VIF) of the continuous explanatory variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Tolerance ($R_i^2$)</th>
<th>Variance Inflation Factor (VIF)</th>
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<td>RPEXP</td>
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Source: own survey result data, 2014

**Appendix Table 2**: Value of Contingent coefficient for dummy explanatory variables

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</tr>
</tbody>
</table>

Source: Own Survey Result Data, 2014