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# Integrating Small Scale Farmers into Bread Wheat Marketing Chain through Contract Farming in Ethiopia

*Getaneh Wubalem[1] and Bekabil Fufa[2]*

*[1]Haramaya University, Department of Agricultural Economics, P.O. Box 138, Dire Dawa, Ethiopia*

*[2]Assistant Professor, Haramaya University, Department of Agricultural Economics,*

*P.O.Box 59, Haramaya, Ethiopia. Tele: +251915740439.*

**Abstract**

The treatment effect censored regression model results of this study showed that educational level, value of agricultural equipment and number of oxen owned affected the participation decisions of the farmers in bread wheat contract farming significantly. The most important factors that determine gross margin obtained from bread wheat production were contract farming experience, the number of oxen owned and participation in contract farming. However, technical efficiency differences and management practices followed were not the reasons for differences in gross margin between the participant and non-participant farmers.

Key words: Contract farming participation; Gross margin and Treatment effect model.

## Introduction

Recently, there is a renewed interest in using contract farming as a means of integrating small scale farmers into agricultural marketing chains nationally and globally. Reduced uncertainty about the quality of the product, sustainability of supply and reduction in price risk are the main deriving forces that make contract farming attractive to agribusiness firms. Contract farming arrangement also provides farmers with access to market (Goodman and Watts, 1997; Glover and Kusterer, 1990); access to credit (Goodman and Wats, 1997; Key and Runster, 1999); could provide new technologies and reduces risks faced by farmers. Many studies have confirmed improvement in the income of farmers as a result of participation in contract farming (Glover and Kustere, 1990; Key and Runston, 1999; Warning and Key, 2002). There are also evidences that show situations where farmers received limited gains from participation in contract farming (Glover and Kusterer, 1990; Key and Runsten, 1999). Thus, the proper analysis of the determinants of farmers' participation decisions in contract farming is important for the design and implementation of policies and strategies to integrate farmers into the agricultural supply chain. Previous, empirical works on the subject include Katchova and Mirand (2000), Key and McBride (2003), Fulton et al. (2003), Mishra and Perry (1999) all of which were conducted in the USA and Warning and Key (2002) and D'Haesa et al. (2003) in Africa. Recently, the Ethiopian government has realized the importance of introducing contract farming arrangement as one of the strategies of integrating small scale farmers into the agricultural marketing chain. Accordingly, the Amahara National and Regional State took the initiative of creating linkages between the agribusiness firms operating in the region that led to the formation of contract farming agreement between producers of bread wheat and flour mill owners during 2003 production year. Beginning the year 2003, Guder Agro-industry Private Limited Company that produces wheat flour entered bread wheat contract farming arrangement with small scale farmers of Wemberma district. According to the contractual agreement, the farmers would sell their wheat produce to the processor at 15% selling price higher than the spot market price during harvest season. However, very few farmers of the district are participating in the program and a substantial number of farmers remain non-participants. In this particular study we analyze the determinants of farmers' participation decisions in wheat contract farming in the district by using data collected from 120 sample farmers. In the next section the theoretical framework of the study is briefly described. This is followed by the presentation of the results of the study in the third section. Finally, the fourth section concludes the paper.

## The Theoretical Framework and the Econometric model

In making choice of whether to participate in bread wheat contract farming or not, the farmer would weigh

the marginal utility obtained from participating in the program evaluated in terms of the utility (net benefit) gained as a result of, for instance, increased income, price risks avoided, etc… compared to utility (net benefit) derived from non-participation decision. Thus, a farmer would be willing to participate in bread wheat contract farming if the utility obtained from bread wheat contract farming $U_i$, is higher than the utility gained from non-participation, $U_j$. The observed indicator (participation decision) is equal to 1 if $U_i > U_j$ and 0 if $U_i \leq U_j$. However, the utility level obtained is determined by the socioeconomic and institutional characteristics of a farmer $(x)$ and other factors $(\varepsilon)$. A farmer's participation decision in contract farming could be denoted by $z = 1$, if the farmer is bread wheat contract farming participant. Thus,

$$pr(z = 1/x) = pr(U_i > U_j)$$
$$= pr(\beta_i' x + \varepsilon_i - \beta_j' x - \varepsilon_j > 0/x) \qquad (1)$$
$$= pr[(\beta_i - \beta_j)'x + (\varepsilon_i - \varepsilon_j) > 0/x]$$
$$= pr(\beta' x + \varepsilon > 0/x)$$

Where, $pr$ and $\beta$ represent probability and parameters, respectively. In this study, a variant of Heckman two stage econometric estimation procedure (Heckman, 1979), the treatment effect model, is used to analyze the determinants of farmers' participation decisions in contract farming and factors that affect gross margin the farmers earn from bread wheat production. Following Green (2000), the treatment effect model used to express contract farming participation decision and gross margin obtained can be given as follows: $z_i^* = \beta' x_i + \varepsilon_i$, where,

$$z = 1 \; if \;\; z_i^* > 0 \text{ and 0 otherwise} \qquad (2)$$

$$y_i = \gamma' w_i + \delta z_i + u_i \qquad (3)$$

Where, $z_i^*$ is a latent variable measuring contract farming participation decision of the $i^{th}$ farmer in the first-step, $z_i$ is a dummy variable that takes a value of 1 if the $i^{th}$ farmer is participant in contract farming and 0 otherwise, $x_i$ are the independent variables that determine contract farming participation decisions, $y_i$ is the value of gross margin used in the second-step, $w_i$ are the explanatory variables of the gross margin regression equation, $\gamma'$, $\beta'$ and $\delta$ are unknown parameters to be estimated, $\varepsilon_i$ *and* $u_i$ □ bivariate normal $[0,0,1,\sigma_\varepsilon,\rho]$.

Different variables were expected to affect the participation decision of farmers in bread wheat contract farming program and the gross margin of the farmers in the study area. These are age of the household (age) head measured in years, educational level of the household head (edu) measured in years of formal grade, value of agricultural equipment owned (val) in Birr, years of experience in bread wheat production (exp), walking distance of residence from near by market (dis) in hours, total amount of land rented in hectares (lse), access to market information (mkt) that takes a value of 1 if the farmers has access and zero otherwise, number of oxen owned (ox), contract farming experience (con) that takes a value of 1 if the farmers is experienced and 0 otherwise, participation in contract farming training (tra) that takes a value of 1 if the farmers has participated and 0 otherwise, the proportion of hired labor to total labor used in bread wheat production (hlb), leadership participation (led) that takes a value of 1 if the respondent has participated in leadership of any formal social organization and 0 otherwise, size of cultivable land owned (cul) in hectares and total size of livestock owned measured in TLU.

## Results and discussion

The econometric model results of the study are shown in table 1. The educational level of the respondent was positively and significantly related to the probability to participate in bread wheat contract farming. This is normally expected as education increases the ability to obtain, process and use information related to better production practices. In addition, the value of the agricultural equipment owned influenced the probability to participate in bread wheat contractual production positively and significantly. This might be due to the fact that bread wheat production on contractual basis requires the intensive use of farm equipment to meet the standards agreed upon on the contract. Also, the number of oxen owned positively and significantly influenced the probability of bread wheat contract farming participation decision and gross margin earned by the farmers. As oxen are the main source of traction power used by the farmers, the availability of more number of oxen will obviously

increase the production of contracted bread wheat that would also increase the farmers' income. In addition, contract farming experience had a positive and significant relationship with the gross margin earning level of the farmers. This is an obvious result as farmers that have such experience of contract farming know the advantages better than those that are less experienced. The positive and significant value of the participation decision variable showed the clear superiority of contract farming in generating additional income to the farmers. Moreover, the coefficient associated with the inverse Mills' ratio was found to be insignificant revealing the absence of other factors such as inefficiency and management differentials as reasons for gross margin differences between the two groups.

## Conclusion

Based on the results of this study the following policy recommendations are suggested. Polices and strategies that would improve farmers access to oxen through mechanisms such as credit provision and improvements in the educational status of the farmers through rural formal and non formal educational programs would increase the farmers' participation decisions in contract farming. In addition, improving farmers' access to agricultural equipment through different strategies such as credit would help to increase the participation decision of the farmers' in contract farming.

On the other hand, efforts aimed at promoting the participation of farmers in contract farming in the district would improve the gross margin and income of the farmers. Also, due consideration should be given to the training and organization of bread wheat producer farmers to help them get better income from the crop.

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**Table 1.** The Econometric Model Results

| Variable | Participation decision coefficients | Gross Margin coefficients |
|---|---|---|
| constant | -5.715 (-3.69) *** | 921.665(3.492) *** |
| edu | 0.153(1.981) ** | 27.584(1.132) |
| age | 0.156(0.806) | - |
| val | 0.443(2.017) ** | - |
| ox | 0.478(1.885) * | 205.675(2.309) ** |
| lad | 0.382(1.56) | - |
| dis | 0.1259(0.471) | |
| hlb | -0.377(-1.476) | |
| exp | 0.9180(1.133) | |
| led | 0.1185(0.267) | 41.6912(0.312) |
| con | 0.739(1.269) | |
| tra | 0.3170(0.655) | |
| mkt | 0.459(1.005) | |
| cul | | 71.779(0.772) |
| live | | -71.979(-2.519) ** |
| lse | | 20.966(0.210) |
| z | | 636.323(2.050) ** |
| con | | 419.500(2.302) ** |
| mkt | | -4.002(-0.026) |
| $\lambda$ | | 20.530(0.118) |
| Log-likelihood function | -32.85057 | -946.0018 |
| Restricted log likelihood | -83.17766 | 977.8878 |
| Chi-squared | 100.6542 | |
| Predicted Success | 75% | |
| $\rho$ | | 0.30478E-01 |

***, ** and * statistically significant at 1%, 5% and 10%, respectively