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Full Length Research Paper

Effects of extension services of firms offering contract farming: A case study of small scale maize farmers in the Limpopo province of South Africa

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A probit regression model was employed in this study to investigate the effect of private extension services on contract farming participation by small scale maize farmers in rural areas of the Limpopo province of South Africa. The study suggested that participation in contract farming was positively influenced by the quality of extension services provided, follow-up visits and type of enterprise. Stock of farm input supply and frequency of extension visits appeared to have negative influence. The study recommended follow-up visits coupled with quality extension services by extension agents after the introduction and adoption of new technology to farmers.

Key words: Contract farming, probit regression, private extension services

INTRODUCTION

Contract farming has an increasingly important role in many developing countries including South Africa. Generally, contract farming involves arrangements obliging a private firm or company to supply inputs (seed, fertilizer, chemicals etc.), extension services, or credit facilities, in exchange for a market agreement that fixes a price for the product and binds the farmer to follow a particular production method or input requirement (Warning and Key, 2002). The contractual arrangement between farmers and a private processing company provides the latter with the assurance that it can appropriate a share of the benefits from the investment it makes in production at the farm level. This is most evident among companies or firms providing extension services and farm input supply to farmers (Eaton and Shepherd, 2001). In most cases, the companies or firms have direct interest in providing effective extension services and farm input supply because they want to obtain high - quality, low - cost produce from the farmers (Sigh, 2002).

Studies indicate that public extension services compared with private extension services have little or no such incentives and regulate their performance in accordance with defined criteria (Miyata, 2007). For example, the volume and timeliness of the supply of inputs (seed, fertilizer, chemicals etc.), number of extension visits to the farms, follow-ups of recommended farm practices, and quantity of inputs distributed are constrained by annual budgets and predetermined. However, these criteria are effective in assessing performance and providing incentives for the production of high quality produce. One would therefore expect the quality of extension services provided in contract farming to be more superior to that found in public or market-oriented systems (Little and Watts, 1994)). In most private contract farming schemes, extension services tend to deal only with the contract crop, although some of the multipartite schemes in Africa use a multicrop approach. Some of the production techniques learned in contract farming schemes are highly crop specific and are not transferable to other commodities.

However, management skills learned through participation in an agribusiness scheme are more widely applicable and include negotiating skills, and awareness of the importance of quality, characteristics of export markets and contract provisions (Knoeber and Thurman, 1995). Generally speaking, there tends to be some transfer of contract farming induced production and management skills to other cash crops and to the farm enterprise as a whole. The situation is similar with respect to farm input provision. The volume and timeli-

Table 1. Description of variables.

Variable	Description
Contract farming:	Dummy: 1=Yes; 2= otherwise
Extension services:	Perceived volume and timelines of inputs (seed, fertilizer, chemicals etc): 1=very good; 2=Good; 3=Average; 4=poor
Estimated farm input supply:	Estimated stock of farm machinery per hectare (Rand)
Extension visits:	Number of extension visits on the farm during the year (number)
Follow-up visits:	Dummy: 1= yes; 2= no
Enterprise:	Dummy; 1= recommended hybrid maize seeds; 2=otherwise

ness of delivery of agrochemicals should be close to optimal in a contract-farming situation, since the company has a secure means of ensuring repayment of in-kind credit through deductions from crop payments (Key and Runsten, 1999).

The main objective of this study was to undertake an empirical case study to investigate the effect of private extension services on contract farming participation by small scale maize farmers in rural areas of the Limpopo province of South Africa.

METHODOLOGY

Data for the study were collected from 396 small scale maize farmers in the Limpopo province of South Africa between 2007 and 2008. The sample comprised households growing maize as a major crop on 1 - 3 ha plots and included both contract and non-contract farmers. The contract farmers among them were those farmers who received inputs and extension services from two firms (Progress Milling and Noordelike Transvaal Kooperasie commonly known as NTK) and sold their maize to the firms through contracts.

The analysis focussed on extension characteristics associated with participation in contract farming schemes and their impact on contract farming. The probit regression model was employed to estimate the probability that a given household will participate in a contract farming scheme given the selected independent variables. In the econometric analysis, the probability that a household head said “yes” to contract farming was estimated as a probit regression model. The question on the suitability of logit or probit regression models is unresolved. However, in most applications, it seems not to make much difference (Green, 2000). In this study the probability of participating in contract farming using the pobit regression model estimated as:

$$\mathbf{Pr(y=1|x) = \Phi(xb)}$$

Where **Φ** is the standard cumulative normal probability distribution and **xb** is called the probit regression score or index. Since **xb** has a normal distribution, interpreting probit regression coefficients requires thinking in the **Z** (normal quantile) metric. The interpretation of a probit regression coefficient, **b**, is that a one-unit increase in the predictor leads to increasing the probit regression score by **b** standard deviations.

Hypotheses

Based on economic theory and previous research findings, the following hypotheses were tested:

1. Participation in contract farming is likely to be influenced by perceived volume and timeliness of input delivery by contracting firms.
2. Framers who receive follow-ups on recommended farming practices through frequent extension visits are more likely to participate in contract farming.
3. High stock of farm input supply is likely to increase the probability of farmers deciding to join contract farming; The type of enterprise for adoption of recommended technology
4 by farmers is likely to have influence on the decision to participate in contract farming.

RESULTS AND DISCUSSION

The description of variables used in the analysis is presented in Table 1. Dummy variables were used to describe contract farming, gender of household head, type of enterprise, and quality of extension services. Likert type of questions was used to assess the perceived volume and timeliness of input delivery. Stock of farm input supply was estimated using market prices of the inputs in Rand.

Table 2 presents descriptive statistics of variables employed in the analysis. Minimum, maximum, mean and standard deviations are presented for the total sample of 396 households. From the table it emerged that the mean estimated farm input supply was R1003.69. The test of equality of group means presented in Table 3 indicated significant differences in the selection of variables between the two groups, contract and non-contract farming households. From the table, it could be inferred their non-contract counterparts and also received more that contract farmers had more farm input supply than extension visits and follow-ups of recommended farm practices. These results underscored the need for non-contract farmers to join contract farming.

The probit regression model was used to explain contract farming participation using variables explained above and were expected to determine household chance of participating in contract farming schemes.

The results in Table 4 indicated that the model was highly significant, as indicated by the P-value ($P<0.00$) of the -2 Log Likelihood and correctly predicted 83.5% of the observed outcomes. As expected, perceived volume and timeliness of delivery of inputs increases the probability that a household will participate in contract

Table 2. Descriptive statistics.

	Min	Max	Mean	Std Dev
Contract farming (Dummy)	1	2	1.57	0.49
Extension service (Dummy)	1	4	2.79	1.03
Estimated farm input supply (Rand)	0.00	7999.50	1003.69	932.83
Extension visits (Number)	1	15	5.02	2.21
Follow-up visits (Dummy)	1	2	1.59	0.49
Enterprise (Dummy)	1	2	1.55	0.49

N = 396.

Table 3. Tests of equality of group means.

Contract farming	Yes	No	Wilk's λ	P-value
	(N_1=171)	(N_2= 225)		
Extension services	2.66	2.88	0.989	0.000
Farm input supply	1140.51	909.55	0.985	0.00
Extension visits	5.30	4.83	0.989	0.036
Follow-up visits	1.99	1.27	0.490	0.015
Enterprise	1.32	1.70	0.861	0.039

N=396

Table 4. Parameter estimates.

Yes to Contract farming	B	Se	Wald	Sig.	Exp(B)
Intercept	-22.87	3.08	55.29	0.00	-------
Extension services	0.60	0.27	4.85	0.03	1.83
Farm input supply	-0.01	0.01	9.83	0.00	0.99
Extension visits	-0.20	0.11	3.65	0.06	0.82
Follow-ups visits	7.99	1.23	41.90	0.00	2935.18
Enterprise	5.47	0.67	67.24	0.00	238.15
-2 Log Likelihood	102.21	(P<0.00)			

Contract farming:	
Yes	43.3%
No	56.7%
Total correctly classified	83.5%

Dependent variable = Contract farming: Dummy: 1=Yes; 2= otherwise; N=396

farming. Volume and timeliness of delivery of farm inputs were associated with greater productivity, hence better ability to finance farm operations through contract farming (Warning and Key, 2002). Contrary to expectations from the stated hypotheses, farm input supply and frequency of extension visits were negatively associated with contract farming. The results suggested that the probability of participating in contract farming was lower among households with low stock of farm inputs and frequency of extension visits. A plausible explanation was that contract farming attracts farmers with high stocks of inputs and frequency of extension visits making them self sufficient.

The implication of the results suggested that high stock of farm assets and frequency of extension visits expected among contract farming households raised them to high levels of self sufficiency compared to the poor and affinity for contract farming (Baumann, 2000). However, further research is needed to unravel the underlying social dynamics that produce these results. The positive coefficient for follow-up visits indicated that more follow-up visits by extension agents were likely to enhance contract farming than farmers who receive few visits.

CONCLUSIONS AND POLICY IMPLICATIONS

A number of policy implications flow from the results of the study. Measures to improve extension services by private firms which include volume and timeliness of farm inputs are of paramount importance. These measures should include setting up appropriate farm input delivery policies and plans, and improving the autonomy and accountability of private firms offering such extension services to farmers. High quality produce and income is likely to be generated as a result of access to volume and timeliness of delivery of farm inputs. Higher incomes may not only raise the standard of living of farmers, but may also create positive multiplier effects for employment, infrastructure and economic growth in the region. In addition to raising income, contract farming exposes growers to new cropping technologies. Identification of potentials of farm inputs such as new varieties of seeds, studies of marketing channels and market promotion efforts will be useful.

Follow-up visits and the adoption of new technology in the form of hybrid maize seeds were found to have a significant relationship with contract farming compared with farm input supply and frequency of extension visits. The study therefore recommends that extension organizations should consider the usefulness of follow-up visits after recommendation of new technology to farmers. These include the arrangement of follow-up visits to farmers after adoption for further education on the technologies. For effective technology adoption by farmers, the use of facilitative methods such as farmers' field days and small plot adoption technique are recommended. Farmers should be given as much freedom as feasible in managing their enterprises, particularly with respect to choice of crop mix and off-farm activities. Restrictions on non-contract crop activities should be avoided. The multiplier effects of contract farming can be maximized by encouraging project authorities to plan for the development of investment opportunities into which growers can channel their new income. Greater use of local resources in transport, maintenance and manufactured goods provision can also make a contribution. Extension services should be designed to provide learning effects that go beyond production of the contract crop. It is unlikely that the debate over single-crop versus multicrop extension systems will ever be resolved: it is difficult to assess the trade-off between the technical superiority that comes from specialization and the efficiency in delivery that comes from multicrop extension. Contract farming studies however; tend to give more support to the latter. Farmers seem to prefer the farm management approach provided by multicrop extensionists, and it could be argued that specialized extension services are often not feasible in very poor countries.

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