



# Journal of Applied Sciences

ISSN 1812-5654

**science**  
alert

**ANSI***net*  
an open access publisher  
<http://ansinet.com>

## Are Informal Market Linkages in Developing Countries Transaction Cost Sensitive? Evidence from Procurement of Smallholders' Produce by Brokers in Kenya

<sup>1,2</sup>I.M. Kariuki, <sup>1</sup>G.A. Obare and <sup>1</sup>E.A. Birachi

<sup>1</sup>Department of Agricultural Economics and Business Management,  
Egerton University, P.O. BOX 536-20107 Njoro, Kenya

<sup>2</sup>Institut für Agrarökonomie (Marktlehre), Christian-Albrecht Universität zu Kiel,  
Wilhelm Seelig Platz 7, Raum 5, 24118 Kiel Germany

**Abstract:** This research uses data from a 2001 household survey conducted in Mwea Tebere Central Kenya to evaluate transaction cost related factors governing the likelihood of using informal linkages in French bean marketing. A logit model is used to determine the likelihood of small farmers using brokers conditional upon locality, infrastructural, market and investment characteristics. Results show that brokers value prior investment in irrigation equipment, farms located near source of irrigation waters, farms situated near villages and low product prices. This lends credence to the predatory behaviour of brokers who exploit social village-ties, fixity of horticultural equipment and coordination and infrastructural inefficiencies in horticultural marketing to perpetuate themselves in horticultural business in the study area and related regions in Kenya.

**Key words:** Verbal agreement, logit, French beans, smallholders, informal linkages

### INTRODUCTION

The inherent uncertainty in the output markets and poor organized marketing institutions for export crops has been the prime mover toward contractual arrangements between small farmers and exporting firms and or individuals in Third World countries to secure entry into international markets (FAO, 1999). In Kenya, this mode of production and marketing has revolved around private firms, individual sponsors, government run schemes, projects managed by non-governmental organisations (NGOs) and community based organisations (CBOs), with Arid and Semi-Arid (ASAL) regions being favoured for irrigated horticulture production (Statistical Abstract, 2001). Brokers command an upper hand among smallholders and seem to pioneer verbal agreements in rural areas (Kariuki, 2003).

Empirical evidence show the incidence of contracts in agriculture is a function of various factors including risk in the form of sharing non-land inputs for which markets are not developed and monitoring considerations (Tunali, 1993), profit sharing (Yokoyama, 1995), uncertainty and need for greater control in the supply chain and the negotiated price (Poole *et al.*, 1998) and moral hazard on the part of the farmer in the supply of effort and the riskness of the technique of cultivation (Ghatak and Pandey, 2000). McLeay and Zwart (1998) note other factors like farmers' perception of marketing competencies and strategy, farm and farm manager

characteristics and the structural characteristics of the industry in which the transaction is taking place.

The socio-economic characteristics of farm households e.g., labour, education, assets, farm size and interest rates (Fukui, 1995) are known to influence existence of contracts. Beets (1990) contends that political environment, public utilities and services, physical and social environment and unrestricted access to land resources are essential ingredients for the success of contract farming especially in the formation of associations or trade groups, which play a significant role in determining production yields and quality.

### SIGNIFICANCE OF PROCUREMENT FROM SMALLHOLDER FARMERS

Despite the many changes occurring along the Global Value Chain (GVC) in the supply of fresh fruits and vegetables in favour of large farmers and own production by exporters, procurement from smallholders in Kenya is still being used for markets with less stringent quality standards using outgrower schemes (Jaffee, 2003), through organized production (Dolan and Humphrey, 2000) or using verbal agreements (Kariuki, 2003). According to NRI/IDS (1999) for example, Homegrown in Kenya procures from smallholders by operating an outgrower scheme, consisting of 900 growers with varying holdings ([www.flamingoholding.com](http://www.flamingoholding.com)). Other exporters under Fresh Produce Exporters Association of

Kenya (FPEAK) have also been sourcing from smallholders by bringing together groups of 15 to 20 smallholder growers, within a radius of 1 km to operate as a single commercial entity (*ibid*).

Dolan *et al.* (1999) find that although procurement was being influenced by UK supermarkets in Kenyan horticultural exporting in favour of large farmers, smallholders supplies made up 18% of total export volumes from four of the largest exporters in 1998 and 11% in 2001. Jaffee (2003) shows that the overall share of smallholders' supplies of fruits and vegetables to the total volume of exports remains substantial at 47% despite the decline precipitated by quality standards and supermarkets dominance in the value chain. HCDA (2004) puts the sourcing of exports of fruits and vegetables from smallholders at between 55-60% of the total volumes exported.

Dijkstra *et al.* (2001) note that most exporting firms source produce from smallholders by engaging them into 'arms length' or contractual production agreements involving provision of inputs and technical assistance. Omosa (2001) also finds the case of procurement from smallholders in practice among three leading exporters involving verbal agreements. Voor den Dag, (2003) and Kariuki (2003) also report use of smallholder supplies in the procurement for export mainly among small and medium exporters using 'gentleman's agreements'.

Mwea Tebere of Central Kenya established as a settlement scheme in the 1950s has been a leading producer of French beans for export market since the late 1970s. Settlement and farming is on red soil regions with the black cotton soil regions being used for rice production (Kariuki, 2003). Horticultural farming is initiated through verbal arrangements with agents of exporting firms, individual entrepreneurs or employees of Horticultural Crops Development Authority (HCDA) with brokers dominating procurement from smallholders. This study seeks to evaluate whether local brokers consider transaction cost elements when linking small farmers to export markets with special reference to French bean procurement.

**CONCEPTUAL MODEL**

Conceptually, a farmer supplying French beans would be free to choose the terms of agreements fronted by the crop buyer be it provision of credit, seeds, fertilizer, extension, price, mode of payment etc. From the buyer's perspective, ownership of irrigation equipment by the farmer, farm-to-source of irrigation water and farm-to-village distances would be important in determining who and where to procure from. The product price is essentially the broker's main disincentive in procurement.

If we denote a local buyer by, *Y*, we can express the behavioural model used to examine the factors influencing the choice of a broker in the region as:

$$Y_i = g(I_i) \tag{1}$$

where,  $Y_i$  is the observed response for the observation (i.e. the binary variable,  $Y_i = 1$  for choice of broker,  $Y_i = 0$  for no choice) and  $I_i$  is an underlying unobserved stimulus index for the observation, where  $I_i = b_0 + \sum_{j=1}^m b_j X_{ji}$ .

Conceptually, there is a critical threshold,  $I_i^*$ , for each farmer; if  $I_i < I_i^*$  the farmer is observed not to have marketed through a broker, if  $I_i \geq I_i^*$  the farmer is observed to have marketed through a broker.  $g$  is the functional relationship between the field observation ( $Y_i$ ) and the stimulus index ( $I_i$ ) which determines the probability of choice of a broker and,  $i = 1, 2, \dots, m$ , are observations on variables for the choice model,  $m$  being the sample size.  $X_{ji}$  is the  $j$ th explanatory variable for the observation,  $j = 1, 2, \dots, n$ .  $B_j$  is an unknown parameter,  $j = 0, 1, \dots, n$ , where  $n$  is the total number of explanatory variables.

The logit model as extensively reviewed in Amemiya (1981) based on the cumulative logistic probability function has been used for this study due to its computational easiness compared to other types (Pindyck and Rubinfeld, 1981). The logit assumes that the underlying stimulus index ( $I_i$ ) is a random variable that predicts the probability of choosing a broker:

$$P_i = \frac{e^{I_i}}{1 + e^{I_i}} \tag{2}$$

Therefore, for the observation the logit is given as:

$$I_i = \ln \frac{P_i}{1 - P_i} = b_0 + \sum_{j=1}^n b_j X_{ji} \tag{3}$$

The relative effect of each explanatory variable ( $X_{ji}$ ) on the probability of choosing a broker in a region is measured by differentiating with respect to  $X_{ji}$ , i.e.,  $\frac{\partial P_i}{\partial X_{ji}}$ . Using the quotient rule:

$$\frac{\partial P_i}{\partial X_{ji}} = \left[ \frac{e^{I_i}}{(1 + e^{I_i})^2} \right] \left[ \frac{I_i}{X_{ji}} \right] \tag{4}$$

In aggregate, the predicted changes in the probabilities of a broker being chosen can be used to estimate the change in the number of small farmers opting for such a linkage relationship. Using the logit, Eq. 3 and 4, we evaluate the effects of various factors on the likelihood of a household linking through the broker to market French beans. The estimating equation was specified as follows:

$$BR_i = b_0 + b_1 CAP + b_2 CANL + b_3 PRIC + b_4 VILD$$

where  $BR_i$  represents choosing brokers for market linkage,  $CAP$ , the value of irrigation investments in Kenya Shillings,  $CANL$ , the farm-irrigation water source distance in meters,  $PRIC$ , the price of 3 kg size carbon and  $VILD$ , is the farm-village distance in kilometers.

**DATA SET**

Data for this study was extracted from a farmer survey in Mwea Tebere of Central Kenya. Structured questionnaires were administered to 60 French bean smallholder farmers over a period of one and a half months in 2001. The farmers were randomly selected within clusters characterized by villages. The principal aim of the study was to evaluate the transaction cost factors that brokers consider when linking smallholder farmers to the export market. Data on the variables included in the model are presented in Table 1.

Table 1: Selected investment, infrastructural, market and locality characteristics (n = 60)

Variable	Description	Mean	Min	Max
CAP	Value of water pumps and sprayers	61,153.62	300.00	276,300.00
CANL	Farm-irrigation water source distance	197.45	10.00	1000.00
PRIC	Price per 3 kg carton	50.50	30.00	140.00
VILD	Farm-village distance	0.5938	0.00	3.50

Source: Author's computations

\*The unit of measurements for CAP and PRIC is Kenya Shillings (Ksh); CANL and VILD are in meters and kilometers respectively

\*1 US dollar = 78.00 Ksh

The high value of irrigation equipment (water pumps and knapsacks) explains farmers' high dependence on agricultural waters for production and need to produce quality beans. The farm-to-irrigation water source distance reflects the location of farms relative to water accessibility with preference placed on farms near or along water canals. Price values denote high spread among the brokers and the farm-to-village distances show concentration of cultivated non-rice farms near settlement areas characteristic of National Irrigation Board regulations (Muiruri and Nyoro, 1999).

**RESULTS**

The equation specifying the determinants of a broker being the link to the export market was estimated using SPSS version 14.0 econometric software. The log likelihood estimates obtained are reported in Table 2. The Cox and Snell R-squared and Nagelkerkes R-squared show considerable strength of association for the variables and Hosmer-Lemeshow-Test indicate the model fits data at an acceptable level.

The results show that all the four variables were significant and only one had the unexpected sign. Horticultural investments (CAP; 0.000) coefficient was

Table 2: Logit Estimates (Dependent Variable, Local Broker = 1, Otherwise = 0)

Variable	B	SE	Wald	Sig.	Exp (B)
CAP	0	0	6.636	0.010***	1.000
CANL	-0.005	0.003	2.758	0.097**	0.995
PRIC	-0.212	0.088	5.766	0.016**	0.809
VILD	-1.219	0.805	2.290	0.130*	0.296
Constant	16.488	5.431	9.216	0.002	

\* indi, Source: Author's computations, \*Indicates that the value is based on statistically significant coefficients: \*\*\* 1%, \*\* 5% and \* 10%, -2 Log-Likelihood: 34.555 , Cox and Snell R-squared: 0.544, Nagelkerkes R-squared: 0.727, Hosmer-Lemeshow-Test: Chi-square, 9.034 and Significance, 0.339

significant at 1% had an unexpected positive sign and independent in explaining the use of brokers in linking smallholder farmers to export markets. The coefficient for the farm-to-water source distance (CANL; -0.005) had the expected negative sign and significant at 5%. French bean price per 3 kg carton coefficient (PRIC; -0.212) was significant at 5% and of the expected negative sign. The coefficient for the farm-to-village distance (VILD; -1.219) had the expected negative sign and significant at 10%.

**DISCUSSION**

Ideally, as the value of irrigation equipment increased, the chances of farmers using the often unreliable, seasonal verbal agreements would decline probably by virtue of wanting more certain and stable income to cover for the capital stock tied in production equipment. This is plausible in the sense that a farmer would seek to produce under more certain conditions especially if investments losses would be enormous when production is interrupted. Kimhi (1994) finds different results when modelling effect of capital stock on the decision to work off the farm. This result could mean that brokers seem to prefer farmers with irrigation investment capital stock irrespective, perhaps as prove of commitment to engage into productive farming, a theme that runs through transaction cost literature (Williamson, 1998). It could also signify ability to engage in farming throughout the year assuring brokers of uninterrupted business. Investment commitment could also mean ruling out of selection problems and consequently reducing costs of search and hidden information.

As the farm-to-source of water distance increased, so decreased the chances of brokers linking smallholders in the procurement of French beans. Again, this is quite in order since most farms are located along National Irrigation Board (NIB) water canals, or near water wells (Kariuki, 2003) a factor that Muiruri and Nyoro (2004) attribute to the heavy pollution of waterways and land degradation through soil erosion into water canals. Nearness to agricultural water means high potential for

smooth production during the year and reduces chances of smallholders asking brokers for credit or soft loan insurance to dig wells or purchase of water pumps and pipes.

With increased French bean prices brokers opt not to procure from smallholders which could lend credence to the seasonality of these traders in the market as observed by (Dijkstra *et al.*, 2001). Low prices underscore the low financial endowment by brokers and subsequently the ever cited exploitation of smallholders by brokers as in (Nyoro, 2004). It could also mean significant risk-averse behaviour on the part of brokers to provide smallholders with insurance in terms of relatively high product price given the intermittent nature of their trading relationships. This effectively reduces their market costs. This result is characteristic of low farm gate prices in developing countries due to proliferation of many market intermediaries or simply poorly developed market institutions (Barrett *et al.*, 2005). The result also reflects the conduct of marketing activities which are dominated by local cartels operating in the farms located far from the main town centres (Nyoro., 2004), who mostly take advantage of coordination and infrastructural inefficiencies in horticultural marketing (McCulloch and Ota, 2002).

There is a high likelihood of brokers linking smallholders whose farms are located near or in the village. This is plausible since brokers are local traders and it is in villages where French bean assembling sheds are situated giving them an opportunity to reduce post-harvest losses through long distance haulage. This preference could also be due to the fact that villages have better links to both rural and feeder roads significantly reducing transport fuel costs, wear and tear and presumably even need for a motorized van for brokers. This result indicates a deliberate move by brokers to reduce search costs since they can reach farmers in their homesteads, expenses in communication due to possibility of easily organizing a 'baraza' and monitoring costs especially when checking on crop diversions to competitors. This corroborates Omosa (2001) finding that there exist strong broker cartels in rural areas which technically dominate and exploit smallholders by virtue of established social ties. There is also observed tendency by smallholder farmers to build market relationships based on trust, friendships and social networks and hence the growth of general inertia to commit to relationships where decisions are highly controlled as in formal contracts (Dijkstra *et al.*, 2001).

## CONCLUSIONS

The development of the horticultural sub-sector in Kenya has been necessitated by the involvement of the private sector especially in the farming of French beans in Mwea Tebere. Since the sector has had no controls over the years and the fact that land tenure in the study area is mainly government controlled through NIB with small pockets of private landowners, private firms and or individual sponsors link smallholder farmers to export markets through contractual arrangements. Local brokers play a significant role in assembling export crops from many sparsely located small farmers. This study sought with special reference to French bean procurement to evaluate whether local brokers consider transaction cost elements when linking smallholders to export markets.

Findings show that brokers consider factors that may reduce their transaction costs when linking smallholders to the market. As the value of a farmer's irrigation equipment increased, brokers' likelihood of preferring such producers increased. Farm-to-source of irrigation water and -to-the settlement village negatively decreased the likelihood of brokerage services. Farmers with farms near agricultural waterways (canals, wells) and near the settlement village increased the likelihood of brokers being a major link to the market. The product price was significant and negatively impacted the likelihood of brokerage activities. The higher the prices the higher would be the deterrent on brokers in marketing. These results show that transaction costs considerations play a major role in the development of market linkages and are pre-conditions for the proliferation of brokers and other middlemen in rural semi-commercial economies.

## ACKNOWLEDGEMENTS

The authors acknowledge financial support for the field survey from Egerton University, Kenya, through the Postgraduate School.

## REFERENCES

- Amemiya, T., 1981. Qualitative response model: A survey. *J. Econ. Literature*, 19: 1483-1538.
- Barrett, C.B., M. Bezuneh, D.C. Clay and C. Reardon, 2005. Heterogeneous constraints, incentives and income diversification strategies in rural Africa. *Quarterly J. Intl. Agric.*, 44: 37-60.
- Beets, W., 1990. Raising and Sustaining Productivity of Smallholder Systems in the Tropics: A Handbook of Sustainable Agricultural Development. AgBe Publishing, Alkmaar, Holland.

- Dijkstra, T., M. Muelenberg and A. Van Tilburg, 2001. Applying Marketing Channel Theory to Food Marketing in Developing Countries: Vertical Disintegration Model for Horticultural Marketing Channels in Kenya. *Agribusiness*, 17: 227-241.
- Dolan, C. and J. Humphrey, 2001. Governance and Trade in Fresh Vegetables. The Impact of UK Supermarkets on the African Horticultural Industry. In *Globalization and Trade: Implications for Exports from Marginalized Economies*, edited by O. Morrissey and I. Filatotchev. London: Frank Cass, 2001.
- Dolan, C., J. Humphrey and C. Harris-Pascal, 1999. Horticultural Commodity Chains: The Impact of the UK Market on the African Fresh Vegetable Industry. IDS Working Paper No. 96. Institute for development Studies. Sussex, UK.
- Food and Agriculture Organization, 1999. The importance of food quality and safety for developing countries. Committee on World Food Security, 25th Session, Rome, May 31-June 3. <http://www.fao.org/docrep/meeting/x1845e.htm> accessed on 20 October 2005.
- Fukui, S., 1995. The Role of Land Pawning in Securing Loans: The Case of SANGLA in the Philippines. *J. Developing Econ.*, 33: 397-409.
- Ghatak, M. and Pandey, P., 2000. Contract Choice in Agriculture with Joint Moral Hazard in Effort and Risk. *J. Development Econ.*, 63: 303-326.
- Horticultural Crops Development Authority, 2004. Horticultural News. The Official News Bulletin of HCDA, Nairobi, Kenya.
- Jaffee, S., 2003. From Challenge to Opportunity: Transforming Kenyan Fresh Vegetable Trade in the Context of Emerging Food Safety and Other Standards. Agriculture and Rural Development Working Paper No. 10; The International Bank for Reconstruction and Development, Agriculture and Rural Development Department, Washington DC.
- Kariuki, I.M., 2003. The Effects of Informal Marketing Contracts on Agricultural Production: A Case of French bean Farming in Mwea Tebere. M.Sc. Thesis, Egerton University (unpublished).
- Kimhi, A., 1994. Participation of Farm Owners in Farm and/or Off-Farm Work Including the Option of Full-Time Off-farm Work. *J. Agric. Econ.*, 45: 232-239.
- McLeay, F. and T. Zwart, 1998. Factors Affecting Choice of Cash Sales versus Forward Marketing Contracts. *Agribusiness*, 14: 299-309.
- McCulloch, N. and M. Ota, 2002. Does Export Horticulture Benefit the Poor in Kenya? Paper presented at Conference on Globalisation, Growth and (In) equality, University of Warwick, March 17-17; also available as IDS Working Paper No. 174, Institute for Development Studies. Sussex, UK.
- Muiruri, H.K. and J.K. Nyoro, 1999. Sustainable Agriculturally Based Rural Livelihoods, Mwea Study Site. Tegemeo Institute of Agricultural Policy and Development of Egerton University.
- Natural Resources Institute/Institute for Development Studies, 1999. Enhancing the development impact of export horticulture in SSA. Workshop proceedings, NRI/IDS. Sussex, UK.
- Nyoro, J.K., 2004. Regoverning Markets; Securing Small-scale Producer Participation in Restructured National and Regional Agri Food Systems: Case of Supermarkets as Outlets for Fresh Fruits and Vegetables and Dairy in Kenya and Uganda. East Africa Regional Summary Report. Tegemeo Institute of Agricultural Policy and Development of Egerton University.
- Omosa, M., 2001. Export Horticulture and Livelihood Strategies: A Focus on the Opportunities and Constraints Facing Smallholder Farmers in Kenya. IDS Discussion Paper No. 3, Institute for Development Studies. Sussex, UK.
- Pindyck, R.S. and Rubinfeld, D.L., 1981. *Econometric Models and Economic Forecasts*. 2nd Edn., London. McGraw-Hill.
- Poole, N.D., F.J. Del Campo Gomis, J.F. Julia Igual, and F.V. Gimenez, 1998. Formal contracts in fresh produce markets. *Food Policy*, 23: 131-142.
- Statistical Abstract, 2001. Economic Survey. Central Bureau of Statistics, Nairobi.
- Tunali, I., 1993. Choice of Contracts in Turkish Agriculture. *J. Econ. Development and Cultural Change*, 42: 67-86.
- Voor den Dag, T., 2003. Export Chain of French beans from Kenya. Unpublished M.Sc. Thesis. Development Economics Group, Marketing and Consumer Behaviour Group, Wageningen University.
- Williamson, E.O., 1998. Transaction Cost Economics: How it Works; Where it is Headed. *De Economist*, 146: 23-58.
- Yokoyama, S., 1995. Agricultural Diversification and Institutional Change: A Case Study of Tenancy Contract in Indonesia. *J. Developing Econ.*, 34: 374-396.