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Measuring payoffs to agricultural training among small holder tobacco producers

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The broad objective of this study was to ascertain whether training in tobacco farming influences tobacco yields and returns among smallholder farmers in Guruve District of Zimbabwe. A total of 40 farmers, selected using quota sampling, were interviewed using structured questionnaires. A multiple regression model was developed to test the working hypothesis that training of farmers impacts farm outcomes at the 5% level. The results of the study showed that yields for trained and untrained farmers were 1522 and 1480 kg/ha respectively. Tobacco returns for trained and untrained farmers were US\$317 and US\$350/ha respectively. Both variables were not statistically different at 5% level. Much of the variance in tobacco returns has been significantly affected by value of loans received and age of the farmer. These results suggest that tobacco farm credit support is important and should be consolidated. However, there is need to provide after-training extension services for farmers to ensure that training influences farm outcomes.

Key words: Tobacco exports, training, smallholder, multiple regression, Zimbabwe.

BACKGROUND AND PROBLEM

Ever since a hundred white farmers grew tobacco in 1905 (Haviland, 1952), tobacco has been an important crop to Zimbabwe's economy contributing an estimated 6% of the GDP (Rukuni and Eicher, 1994). In 1992, the country was the second largest producer of flue-cured tobacco after Brazil (Zimbabwe Tobacco Yearbook, 1992). Between 1994 and 1996, tobacco export earnings were US\$ 407, US\$ 545 and US\$ 462 million respectively. This trend was largely attributed to high tobacco productivity of between 2510 - 2640 kg/ha. The tobacco industry during this period employed about 500000 people in the 1990s and also to fixed capital formation, an effervescent institutional setup and investment in massive warehousing facilities, which were rated as the world's largest (Zimbabwe Export Directory, 1998). There were 15000 registered tobacco growers in 1998, of which 9600 were burley growers and 800 oriental growers. There was a marked decrease in the value of tobacco exports in 2001 from US\$ 640 million to US\$ 204 million in 2002 and US\$ 396 in 2004 (FAO Statistics, 2004).

Fluctuations in tobacco exports experienced during the late 1990s and the turn of the millennium can be linked to a number of factors including a volatile macro-economic environment which stifled access to inputs by farmers, structural re-organization of the agricultural sector which brought in more smallholder farmers with little know-how, droughts of 2001/02 and 2003/04, poor access to technology and loans (Van Burren, 2001). The structure of the tobacco sub-sector has changed since the implementation of the land and agrarian reforms by the government of Zimbabwe in 2000. By April 2001, a total of 2706 farms with 6,086,605 ha of land had been designated for mandatory acquisition and re-distribution. Between July 2000 and 9 February 2001, a total of 51,543 households were settled on 2,083,301 ha of land (FAO, 2001). Tobacco productivity has been declining from 2200 kg/ha in 1998 to about 700 kg/ha in 2001 (Ministry of Lands and Agriculture, 2005).

In response to declining productivity and export contribution of the tobacco industry, the government of Zimbabwe has been providing input subsidies through the National Economic Development Priority Program (NEDPP). The government has also given mandate to institutions such as the Farmers Development Trust (FDT) to implement tobacco-training programs targeted

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at small holder tobacco farmers. Literature points out that agricultural training or education of farmers may enable them to better process information provided by different sources and may increase both allocative and technical efficiency (Jamison and Lau, 1982). The availability and quality of training services influences farm outcomes. It is asserted that trained smallholder farmers produce better quality crops and yields than untrained smallholder farmers. This assertion has not been systematically assessed in a changing context brought about by the land and agrarian reforms in Zimbabwe. Thus the objectives of this study were to:

1. Assess whether there are differences in tobacco yields among trained and untrained smallholder farmers operating under the same social and economic setting.
2. Determine whether training influences returns to factors of production invested in tobacco.

The working hypothesis in this study is that trained smallholder tobacco farmers have higher yields and returns to factors of production than untrained smallholder tobacco farmers due to greater efficiency of resource use.

Conceptual framework linking agricultural training and agricultural productivity

A number of models have been used to conceptualize the linkage between investment in agricultural training and agricultural productivity. Roe and Graham-Tomasi (1986) suggested the use of farmer or farm household optimization models, which are *inter alia* maximizing expected profits, expected utility of profits or consumption and leisure subject to constraints imposed by production function constraints and time. However, the expected profit approach is more common in literature. The expected profit approach argues that investment in agricultural training results in marginal benefits and costs to the farmer. Discounted expected profits $E(.)$ will be composed of two parts: the difference in the discounted expected value of production of all crops and livestock with and without training minus the difference in costs. This can be thought of as two profit functions, each of which is affected by base year constraints and information of farmers. Strauss et al. (1991) note that the constraint and information sets include four components emanating from the farm level and community levels. Land and human capital factors (education and experience) are viewed as the constraints at the farm level whilst the level of farm services (extension-training and input marketing services) and climatic conditions are pointed out as critical at the community level. Agricultural training or education of the farmer may enable the farmer to better process the information provided by different sources and may increase both allocative and technical efficiency (Jamison and Lau, 1982). Thus the availability and quality of extension services influences farm outcomes. Based on the above

arguments, the statistical models are as follows:

Let $V_{iA} = X_i \beta_A + \varepsilon_{iA}$ be the discounted expected profits with agricultural training for the i^{th} farm, where X_i is a vector of farm and community characteristics noted above and ε is a random term.

Let $V_{iN} = X_i \beta_n + \varepsilon_{iN}$ be the discounted expected profits without agricultural training.

Let $V_i = V_{iA} - V_{iN}$, Then $V_i > 0$ if agricultural training leads to allocative and technical efficiency, greater productivity and profits and if not $V_i < 0$. We do not observe V and the random term but X and whether the farmer is trained or not.

Conceptualization of training

Training is the process of bringing a person to an agreed standard of proficiency by practice and instruction (The Collins paperback dictionary, 1986). To train is to teach someone (to do something), as by subjecting to various exercises or experiences. Prasad (1994) argues that training is an omnipresent concept- it is required in shorter or longer perspective in all-academic or non-academic pursuits, may that be research, education or extension, either in government or private sectors in urban or rural situations. It is an intellectual investment for human resources development (HRD). In the context of this study, a trained farmer is one who has undergone some form of agricultural training course either a master farmer training or short and or long term training courses offered by FDT and also one week modular courses. An untrained farmer is one who has not gone through any formal agricultural training course on the growing of tobacco but only grows the crop through watching others and through experience from working on commercial farms.

Studies focusing on impact of tobacco training programs in Zimbabwe

There were more than 60 training centres countrywide by 2000 training farmers on good crop management techniques and animal husbandry (Rukuni et al 2006). They range in size from small-scale district training centres to agricultural colleges and departments of agriculture at universities. Many organizations- private and public were and are still involved in farmer training of various duration, focus and quality.

Chipika (2000) evaluated the master farmer training programmes in Zimbabwe and how they performed since 1985 and whether master farmers had become better farmers by following the recommended practices. The author also noted that a new policy was drawn up for the establishment of the "Advanced Master Farmer Training

Scheme" which placed emphasis on bookkeeping, budgeting and its application on the trainees own plots. This program also made functional trainees literacy skills making possible" a business like approach to farming" incommunal areas. The main conclusion of the study was that the scheme had played a fundamental role in for Zimbabwe's communal farmers. Nyamazana (2000) did a study on the evaluation of FDT intervention in Mutungagore-Tsamvi in Mount Darwin. One of the underlying hypotheses tested was that intervention of FDT had a positive impact on the tobacco production by the smallholder farmers, which was made operational using the "before and after" framework. The researcher concluded that gross margins were quite low before FDT intervention and afterwards were three times as high.

RESEARCH METHODOLOGY

Study site

This study was conducted in, Guruve district located in natural region III in Mashonaland Central Province. Natural region III is one of five agro-ecological regions in Zimbabwe. This natural region is characterized by moderate rainfall of 650 - 800 mm per year and is erratic in nature. It covers 6,854,958 ha, that is 17.43% of total land, with relatively high temperatures of 22 - 32°C, and sometimes subject to seasonal droughts. Crops such as maize, tobacco and cotton are commonly grown. Semi-intensive livestock production systems are suitable for the region.

Research design

According to Treece and Treece (1986) a research design begins by developing a framework based on the-ory. The advantage of crafting a researcher design is that it enables the researcher to fit the research plan together once an overview of the research is determined. Most researchers combine pure and applied research in the manner they feel that the ultimate goal is a study that is helpful in solving social problems and at the same time making a valuable contribution to the theoretical social-science literature (Leedy, 1980). A comparative case study was used in the study to compare farm outcomes for trained and untrained farmers. Reasons that prompted choice of this approach includes the high degree of representativeness, appropriateness in observing empirical data, information received is of a large scale, cost effectiveness and its comprehensiveness (Basson et al, 1995).

Sampling techniques

Quota sampling was used to select 40 farmers for inclusion in the study. This was done to take into account the training status of farmers. This type of sampling is useful when a particular group or characteristic is less wide-

spread in a population; in this case the trained farmers. By selecting a quota and selecting study units until the quota is filled; the group one wants in the sample is present. The research was based on similarity of farming conditions and soil fertility.

Data collection tools

The main tool that was used for data collection is a formal questionnaire administered to the small holder farmers. The structured questionnaire catered for both trained and untrained farmers. The questionnaire focused on issues that included costs and revenues of the farmers, acreage cultivated, family sizes etc. Closed and open questions were used to get the respondents' views of the subject under study. The closed questions covered such topics as; farm size, area allocated for tobacco and other crops and also the number of people living on the farm and their yields. Open-ended questions covered issues such as the constraints the farmers face in growing tobacco and what they think should be done to solve these problems. Other questions were centered on whether farmers have benefited from training and for the untrained farmers whether they feel disadvantaged by their lack of training.

Data analysis

The multiple regression model was used to study the relationship between the dependent variable (tobacco crop gross margins) and several independent variables that affect it. The set of independent variables included, the training attained by the house hold head, age of the household head, sex of the house hold head, labour, the size of land under the tobacco crop, education level attained by the household head, and value of credit used. This model was opted for because the researcher wanted to ascertain the combined effects of different variables on tobacco returns in the study area.

The multiple linear regression model can be shown as:

$$Y = B_0 + B_1X_1 + B_2X_2 + \dots + B_nX_n + U \text{ (Ramanathan, 2002).}$$

Where, Y = Dependent variable, B_0 = Constant, B = the partial regression coefficient X = independent variable n = nth variable U = random disturbance term

The model was then:

The disturbance term contains factors other than those captured by the researcher but that affect the tobacco gross margins. Financial items in the model were expressed in their official US\$ equivalent (Z\$1US\$ = ZS\$110000 as of 2005/06) to cater for the inflationary tendencies experienced in the country.

Table 1. Multiple regression results

Variables	B value	Significance (p<0.05)
Constant	8988.00	0.015
Age of farmer	-157.3	0.037
Gender of farmer 1-male, 2-female	-694.22	0.269
Training 0-trained, 1-not trained	171.243	0.779
Land size	-384.21	0.393
Educational level of farmer, 0-primary, 1-secondary	-443.5	0.485
Effective labour	313.5	0.126
Loan value equivalent (US\$)	1.040	0.000
R-squared: 0.747, Adjusted R-squared = 0.686, F-value = 12.6 (p = 0.00)		

RESULTS

Socio-economic characteristics of sample

Most respondents were located in Guruve District of Zimbabwe. All the farmers interviewed grew tobacco on an average area of 2ha. The average household size was 5 members per household. Almost all the respondents (92%) were married while the rest were widowed. The majority of the farmers attained primary education (46%). Land is entirely owned by the household heads with only a few having been given a small portion by parents or grandparents. Most farmers in the district grew tobacco, maize and groundnuts.

Tobacco yields and gross margins between trained and untrained farmers

The average tobacco yields for untrained and trained farmers were 1522 and 1480 kg/ha respectively. The yields were not statistically different at the 5% level ($p = 0.867$). The gross margins per hectare were Z\$ 34,947,368 (US\$ 317) and Z\$ 38,535,714 (US\$ 350) respectively for untrained and trained farmers respectively and the results were not statistically different at the 5% level of significance ($p = 0.84$). Multiple regression results are shown in Table 1.

The multiple regression results showed that the age of the farmer had a significant negative relationship with tobacco income variance. Younger farmers obtained higher incomes than elderly farmers. The dependent variable was also positively related to the value of loan size received ($P < 0.05$). However, sex of the household head, training, total land size and labour availability did not significantly influence tobacco income ($P > 0.05$). The working hypothesis posited in the study is rejected implying that training did not significantly influence tobacco returns among smallholder farmers in Guruve district. Variables included in the model accounted for 75% of the total variation in tobacco income indicating goodness of fit.

DISCUSSIONS

According to the results of multiple regression, the value

of loans had a significant positive effect ($p < 0.05$) on returns earned in tobacco production. This implies that farm credit support programs had a significant effect on tobacco farm income variance. This finding has been acknowledged by a number of authors. Rukuni and Eicher (2006) noted that provision of agricultural loans in Zimbabwe have been one of the major prime movers in agricultural production. Von Pischke et al. (1984) asserted that credit provision enables rural farmers to adopt modern technology and improve agricultural practices for increasing agricultural production and productivity. Hulme and Mosley (1996) argued that without credit provision farmers would be forced to reduce hectares as the cost of inputs in the country is increasing annually. The prerequisites and conditions for improving smallholder farming and reducing poverty in rural areas include input and credit supply.

The age of the farmer had a significant negative effect on tobacco farm returns, implying that younger tobacco farmers had more income than older farmers. These findings can be attributed to use of new technologies by younger farmers. Yaron and Dinar (1992) noted that old aged farmers generally tend to resist change than young farmers. Culture is the most basic determinant of a person's wants and behavior. It includes the basic values, perceptions, preference, and behavior that a person learns from family and other traditions. Old aged farmers are usually risk averse and there is an emphasis on role and procedures. New ideas are often dismissed and experience is highly valued.

Training in tobacco production was included as a dummy variable in the model and was not significant at the 5% level. Most studies have shown that training of farmers increases productivity (Nyamazana 2000; Gunning et al., 2000; Birkhauser, 1991; Patrick ann Kehrberg, 1973). The finding of the study is not consistent with most reviewed studies. Despite the fact that some farmers had received training in tobacco production from Farmers

Development Trust, most of the farmers indicated that they did not have access to complementary extension services after training. Previous research suggested that the performance of farmers hinges not only on access to training but quality extension services (Strauss et al.,

1991). Variables such as: gender of farmer, land size and effective labour availability did not significantly influence tobacco returns in this study. This could be attributed to the fact that farm and household size were not significantly variable among households interviewed in the study. Both male and female farmers had relatively equal access to credit and training opportunities in tobacco production.

Conclusions and Recommendations

Training status of farmers in tobacco production did not significantly influence yields and tobacco returns in Guruve District. Much of the variance in tobacco returns was influenced by the value of loans given and the age of farmers. The working hypothesis posited in the study that training influences tobacco yields and returns was rejected at the 5% level. The results of the study suggest that farm credit support programs have a significant impact on farm returns. If farmer training is to influence outcomes on smallholder farms, there is need to provide quality, complementary, adequate and appropriate extension services after training of farmers.

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