

*Full Length Research Paper*

## Viability of tobacco production under smallholder farming sector in Mount Darwin District, Zimbabwe

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Smallholder commercial agriculture in developing countries is hinged on cash crop production and in Zimbabwe tobacco is increasingly becoming an important smallholder cash crop. This study therefore, analyzed the viability of tobacco production by smallholder farmers in Zimbabwe. Cross sectional survey data was collected for the 2010 and 2011 production season from 60 smallholder households in the Mount Darwin District of Mashonaland Central Province in Zimbabwe. Data were analyzed using descriptive statistics, gross margin analysis, breakeven analysis and ordinary least square (OLS) criterion to determine the viability and determinants of income earnings from tobacco by farmers. The study revealed that, smallholder tobacco production was viable, with farmers achieving average yield of 2052 kg/ha, average price of US \$2.45 per kilogram and earning, on average, about US \$2352 per hectare as gross margin. Break-even analysis revealed a margin of safety of 50% with respect to both yield and prices, indicating that, small-scale tobacco production will remain lucrative even at much lower prices and yields. Regression analysis showed that, off farm employment was inversely related to revenue earnings from tobacco with coefficient (-0.058) and the relationship was significant at 5%. Price and yield were positively related to tobacco gross margins with coefficients 0.865 and 1.001 and the relationship was significant at 1%. It is therefore concluded that, tobacco production is viable and can improve incomes for smallholder farmers. To improve income earnings from tobacco, there is a need for farmers to focus on farm production for better yields and improve quality for better prices.

**Key words:** Break even, gross margins, income, off farm employment, yields, quality.

### INTRODUCTION

In Zimbabwe, the 2000 fast track land reform has been characterised by radical reconfigurations of land, production, economy and livelihoods in the rural landscape (Mavedzenge et al., 2008) and brought about benefits and opportunities as well as costs, challenges and pitfalls (Scoones et al., 2010). What is clear is that, there is a move to commercialise small-scale production, and integrate more effectively black indigenous farmers into the national economy, hence the increased

participation of smallholder farmers, who now command the majority of the land used for agricultural purposes in Zimbabwe (Shumba and Whingwiri, 2006).

“Smallholder farmers” is used more generally to describe rural producers, predominantly in developing countries, who farm using mainly family labour and for whom the farm provides the principal source of income (Ellis, 1988) and in Zimbabwe it is used loosely to define indigenous black farmers. In Zimbabwe smallholder

agriculture has been traditionally based on a wide range of rain fed, seasonal food crops for balanced household nutrition and risk aversion. Small scale farming has been important for food security, contributing 42% of total maize production (the staple in Zimbabwe) in 1980 increasing to 60% in 1985 and then 70% in 1999 (Rukuni, 2006). Commercial agriculture in Zimbabwe is important for generating raw materials for the manufacturing industry, generation of foreign earnings, and ultimately economic growth. In addition, commercial production mainly focuses on year round production of high value cash and export crops, using production systems based on modifications of the natural environment and use of highly mechanised machinery.

The new agrarian structure in Zimbabwe entails commercialisation of smallholder agriculture, hence the need for smallholder diversification into high value crops like tobacco. Tobacco "the golden leaf" has been the single most important export commodity in Zimbabwe. Tobacco generates in excess of USD650 million in foreign revenue annually, by 1991 Zimbabwe had become the world leading exporter of flue cured tobacco, accounting for around 40% of its foreign currency earnings and contributing approximately 10% of country's GDP (Muir-Leresche, 2006). Tobacco generates employment more than any other crop in the country. It directly employs over a million people, and many more in the downstream industries. The area under flue cured tobacco increased from 61 180 ha in 1950 to 84 857 ha in 2000, the quantity of tobacco produced also increased from 47 294 tonnes in 1950 to a peak of 236 946 tonnes in 2000 (Cole and Cole, 2006).

The 2000 agrarian reforms also transformed the structure of the tobacco sub-sector. There were 15000 registered tobacco growers in 1998, currently there are more than 64 000 predominantly smallholder tobacco growers in Zimbabwe (Tobacco Industry and Marketing Board (TIMB), 2011). The increase in the number of producers has been accompanied by decline in the area grown per farmer and of concern is also the decline in productivity. Tobacco productivity declined from 2200 kg/ha in 1998 to about 700 kg/ha in 2001 (Ministry of Lands and Agriculture, 2005). Tobacco output plummeted from a record level of 267 million kg in 2000 to 73 million kg in 2007 (Dawes et al., 2009). 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, 2004), weakening Zimbabwe's competitive position in the world market for flue cured tobacco in favour of China, India, and Brazil. Tobacco has been a highly profitable and lucrative crop for commercial farmers in Zimbabwe (Rukuni, 2006) however for smallholders there is need for research based inquiry to ascertain economic benefits of choosing tobacco as a cash crop enterprise.

In Zimbabwe as in many developing countries, smallholder agriculture was viewed as a failed sector, and smallholder farmers as severe degraders of the

environment. This notion is however debatable. For example in Zimbabwe prior to the fast track land reform program, and because of colonial injustices, smallholders typically occupied communal areas in more fragile and marginal environments. In addition Zimbabwe has a well-documented post-independence smallholder productivity success story, though some argue that the drastic increase in output from the smallholder sector has been largely a result of the increase in areas planted while crop yields have remained almost static (Takavarasha, 1994). Smallholder farmers in Zimbabwe now have access of land in high potential areas and questions regarding potential of small scale commercial agriculture to successfully produce cash crops of economic importance and their potential in improving smallholder household incomes remain unanswered. This study was therefore designed to (i) investigate viability of tobacco as a smallholder cash crop in Zimbabwe and (ii) determine the determinants of viability.

## MATERIALS AND METHODS

### Study area

The study was carried out in Mount Darwin, a District in the Mashonaland Central province of Zimbabwe. Mashonaland Central province accounts for about 30% of Zimbabwe's tobacco output (TIMB, 2011) and Mount Darwin is in Natural region III, a semi-intensive farming region with moderate rainfall. The study area comprises mainly of small scale farmers who are into cash and food crop production.

### Sampling and sample size

Using a two-stage-selection approach, a random sample was selected. The first stage identified all smallholder tobacco farmers in Mount Darwin using the TIMB database. The second stage identified, from a list of all smallholder tobacco farmers, all newly resettled farmers. Finally the identified farmers were stratified in to 3 main tobacco growing areas based on information provided by district extension workers from which a random sub-sample of 20 was drawn from each for an in-depth study.

### Data collection

A structured questionnaire was used to interview the selected farmers. Secondary data for each household on yield, credit provided to the household, price, area, average weight of tobacco bales delivered and total sales revenue was obtained from TIMB. Secondary data was considered to be more reliable than the primary data obtained from interviewing the smallholders. Data from the structured questionnaire was therefore cross-referenced with secondary data and in cases of discrepancies, secondary data was given in preference.

### Data analysis

Data analysis methods used were descriptive statistics, gross margin analysis, break even analysis and regression analysis. Details of these analytical techniques are given in this section.

## Descriptive statistics

Descriptive statistics were used as a preliminary investigation procedure to gain an understanding of inherent significant socio-economic characteristics of the smallholder farmers.

## Gross margin analysis

Johnson (1985) defines the gross margin as, the gross income from an enterprise less operating (variable costs) of production. Although a gross margin is not profit as it does not include fixed or overhead costs such as depreciation, interest payments, rates and permanent labour, which have to be met regardless of enterprise size. Gross margin serves as the unit of analysis in evaluating the economic performance of an enterprise and gives an indicator of the viability of an enterprise and its potential contributing to household income. Gross margins are generally quoted per unit of the most limiting resource, for example, land, hence crop gross margins are provided on a per hectare basis.

Gross margins were computed as follows:

$$GM = P_q Q + \sum_i P_i X_i$$

Where, GM is gross margin in US dollars per hectare for the tobacco crop enterprise;  $P_q$  is the price of tobacco per kg; Q is the quantity of crop output per hectare in kg;  $P_i$  is the price of the  $i^{th}$  variable input used in tobacco production; and  $X_i$  is the quantity of the  $i^{th}$  variable input per hectare.

## Breakeven analysis

The breakeven price is the minimum price per unit required to cover all production costs at the anticipated yield and was computed as follows:

$$\text{Breakeven Price} = \frac{\text{Anticipated Total Production Costs}}{\text{Anticipated Yield}}$$

The breakeven yield is the minimum yield required to cover all costs at the anticipated price per unit and was computed as follows:

$$\text{Breakeven Yield} = \frac{\text{Anticipated Total Production Costs}}{\text{Anticipated Price}}$$

## Ordinary least square (OLS) analysis

For the study the dependant variable was total tobacco gross income (US\$/ha). Though profit maximisation is the objective in smallholder cash crop production and ideally, one would wish to model profits directly through the incorporation of variable costs, fixed costs and revenues pertaining to the input-output relationship. Profit is difficult to measure for a single crop in a smallholder setup due to unavailability of records on crop-specific inputs (Fulginiti and Perrin, 1998). In addition the dependence on family labour often makes it difficult to disaggregate and allocate it for specific intra-household cropping activities. The Cobb Douglas functional form was used for its simplicity, flexibility and also the empirical support it has received through wide applications on data for various industries and countries.

$$\text{Log}Y = \beta_0 + \beta_1 \text{Log}X_1 + \beta_2 \text{Log}X_2 + \beta_3 \text{Log}X_3 + \beta_4 \text{Log}X_4 + \beta_5 \text{Log}X_5 + \beta_6 \text{Log}X_6 + \beta_7 \text{Log}X_7 + \beta_8 \text{Log}X_8 + \beta_9 \text{Log}X_9 + \beta_{10} \text{Log}X_{10} + \beta_{11} \text{Log}X_{11} + u$$

Where, Y = Tobacco Gross Income/ha;  $X_1$  = Tobacco area;  $X_2$  = Variable costs/ha;  $X_3$  = Labour;  $X_4$  = Cattle;  $X_5$  = Employment off farm;  $X_6$  = Training in Agriculture;  $X_7$  = Sex;  $X_8$  = Age;  $X_9$  = Price/kg;  $X_{10}$  = Yield/ha;  $X_{11}$  = Maize area;  $\beta_0, \dots, \beta_{11}$  = Parameters to be estimated; u = Random error.

## Tobacco area

Tobacco area is the total area allocated for tobacco cultivation by the household in hectares. Increasing the area under cultivation can possibly bring about economies of scale associated with efficient use of fixed and highly specialised assets required by tobacco, for example curing barns and grading sheds. The expected effect on revenue is positive.

## Variable costs

Variable costs in US dollars were computed by summation of expenditure on all variable inputs for the tobacco enterprise per hectare. A household spending more on fertilisers, crop protection chemicals, fuel and seeds can be expected to achieve high yields and better quality. Revenue from the tobacco enterprise is expected to thus increase with intensity of variable input use.

## Labour

This is the number of hired workers engaged by the household specifically for tobacco production. Tobacco competes with maize for labour as the two crops are grown in the same season, and many key operations like planting, weeding and harvesting coincide. In smallholder agriculture family labour is usually prioritised for food security crops, therefore engaging hired labour thus, reduce losses due to weed competition, pre and post harvesting losses for cash crop enterprises. The expected effect on revenue is positive.

## Cattle ownership

Cattle ownership was measured by the number of cattle belonging to the household. Addition of cattle as a variable in the model was justified for smallholders as cattle are a source of draft power and just like labour, cattle can be considered as direct inputs. A household endowed with more cattle can timely execute key operations such as, land preparation, weed control, harvesting and transportation, all of which require cattle draft power. The expected impact on revenue is positive

## Off- farm employment

Some small-scale farmers are full time farmers while some have full time formal employment in urban areas, hence are part time farmers. The expectation was that full time farmers ( $X_5 = 1$ ) could realise more revenue from their farming operations, as they are resident on their farms. Full time farmers allocate more time to their farming operations and accord more attention to their farming enterprises than those having off farm formal employment ( $X_5 = 2$ ). Off farm employment was therefore anticipated to negatively impact tobacco revenue.

## Training in agriculture

Training in agriculture was regarded as any form of training in agriculture by the household head. Training brings about better

decision making, better use of production technology, adoption of appropriate technology and adherence to recommended production practices. Those trained in agriculture ( $X_6 = 2$ ) were therefore expected to be more productive than those without any training in agriculture ( $X_6 = 1$ ). Tobacco is a highly specialised crop whose yield and quality is very sensitive to quality of management and hence, training in agriculture was expected to impact tobacco revenue positively.

### Sex

Tobacco has high labour and capital demands. Crop ownership and gender are therefore important in Zimbabwe, where men control all important household resources and make decisions on family labour and household resource allocation. If the tobacco crop belongs to men ( $X_7 = 2$ ) it was anticipated that, productivity will be high and if the tobacco crop belongs women ( $X_7 = 1$ ), productivity was expected to be low.

### Age

Age was measured by the number of years for the household head. Even though accumulation of farming experience and production capital comes with age. In Zimbabwe older farmers have bigger household sizes and are more worried about food security. When food crop production takes precedence, efficiency in cash crop production can be compromised. Furthermore, in developing countries age is usually negatively correlated to education and literacy levels. The younger being likely more educated and literate, the expectation was age negatively impact productivity.

### Price

In tobacco production, price varies with quality. Farmers achieving better quality attain better prices and ultimately high revenue. Agronomic practices as well as the curing process influence leaf quality. The expectation was that, price positively impact tobacco revenue.

### Yield

Marketable yield in smallholder tobacco is dependent on agronomic practices and more important for smallholder farmers are post-harvest losses. Yield was expected to positively impact revenue.

### Maize area

Maize is the staple in Zimbabwe and competes with tobacco for land, labour and other production inputs. The expectation was that, as the area under maize cultivation increases, tobacco revenue would be reduced.

## RESULTS

### General socio-economic characteristics

According to results in Table 1 the mean age of surveyed farmers was 40.58 years indicating that, most smallholder tobacco producers were fairly middle aged farmers. Farmers had an average 6.4 ha and most (5.1ha) of it was being cultivated. The average area under maize and

tobacco were 1.41 and 1.3 ha, respectively. On average farmers had about 15.8 years of experience in general farming but had fewer years of farming tobacco (7.1 years). Employment of permanent workers was very minimal with an average of 0.8 per household; however farmers relied more on seasonal workers who averaged 6.22 per household per season. Ownership of equipment such as tractors and cars was very low with an average of 0.01 and 0.2, respectively. On average household ownership of cattle was 5.95 indicating that most farmers had cattle. The average price of tobacco per kilogram was US \$ 2.45 and the average yield was 2052 kg/ha.

There was a lot of private sector support and involvement in tobacco production as most of the households received inputs on credit and hence, used very high rates of fertiliser, applying 321 kg/ha mean basal fertiliser, and on average 86 kg/ha of top dressing. All farmers reported using firewood for curing their tobacco and only 30% reported using firewood in combination with coal. Many of the small scale farmers were full time farmers and only 25% of the farmers had formal employment and farming was part time. More than half of the farmers had never been exposed to any form of training in agriculture and only 45% of the farmers had received training in agriculture. Tobacco production was dominated by males and in 82% of the households the tobacco crop belonged to a male household member.

According to results in Table 2 the mean total revenue from tobacco per hectare was US \$5120 and the mean total variable costs per hectare were US\$2768 resulting in average gross margins of US\$ 2352 per hectare. This outcome shows that tobacco production by smallholder farmers was viable. From Table 3, the computed breakeven yield was 1100 kg/ha and the breakeven price was 1.21/kg. The margin of safety was 46 and 50% with respect to both yield and prices respectively (Table 3).

### Determinants of income earnings from tobacco

Regression analysis showed that off farm employment was inversely related to revenue earnings from tobacco with coefficient (-0.058) and the relationship was significant at 5%. Price and yields were positively related to tobacco revenue with coefficients 0.865 and 1.001 and the relationship was significant at 1% (Table 4).

The coefficient of determination ( $R^2$ ) of 90.7% indicated the strong explanatory power of the model with only 9.3% of the variation in the dependent variable (income earnings from tobacco) being explained by other factors nor specified in the model.

## DISCUSSION

### Viability of tobacco production

Tobacco production was observed to be an important

**Table 1.** Descriptive analysis of the general socio-economic characteristics.

Variable	Minimum	Maximum	Mean	Standard deviation
Age of household head	26	71	40.58	10.40
Total land area (ha)	2	13.5	6.4	6.9
Area under cultivation (ha)	1	9.5	5.1	3.4
Farming experience (years)	3	45	15.8	8.9
Tobacco experience (years)	2	25	7.1	5.8
Permanent workers	0	4	0.8	1.1
Tractors	0	1	0.01	0.2
Cars	0	2	0.2	0.4
Seasonal workers	0	15	6.22	3.69
Number of cattle	1	18	5.95	3.88
Area under maize (ha)	.5	4.0	1.41	0.62
Area under tobacco (ha)	1	3	1.3	0.51
Price/kg (USD)	1.18	3.63	2.45	0.50
Variable costs/ha (USD)	2365	3139	2768	206
Yield/ha (kg)	207	3938	2052	1
Total revenue/ha (USD)	370.2000	11037.26	5120.06	3
		<b>Frequency</b>	<b>%</b>	
Formal employment	Yes	45	75	
	No	15	25	
Training in agriculture	Yes	27	45	
	No	33	55	
Sex of household head	Male	49	82	
	Female	11	18	

**Table 2.** Smallholder tobacco gross margin analysis.

Variable	Minimum	Maximum	Mean	Standard deviation
Gross margin/ha	-2397	8269	2352	2.20
Total revenue/ha	370	11037	5120	2.89
Total variable costs/ha	2365	3139	2768	206

**Table 3.** Breakeven analysis.

Variable	Yield kg/ha	Price US \$/kg
Achieved	2052	2.45
Breakeven	1100	1.21
Margin of safety (%)	46	50.6

smallholder enterprise, as farmers allocated approximately equal land areas to tobacco and maize (the staple in Zimbabwe). The primary objective in smallholder tobacco production is profit maximization. This is because tobacco smallholder is strictly a cash crop and about 98% of the tobacco produced in Zimbabwe is exported (TIMB, 2011). The mean gross margin was US \$2352 per hectare, indicating that,

tobacco is a viable smallholder cash crop and contributes significantly to rural household income. This finding has been acknowledged by a number of authors. Keyser (2002) noted that, tobacco generated direct income for commercial farmers and indirect (wage) income for smallholder farmers, though the current study showed a transition of smallholder tobacco income from being indirect to direct income.

**Table 4.** Regression results to determine factors affecting income earnings from tobacco production.

Variable	Beta	Standard error	Significance
Constant	-0.040	0.101	0.690
Sex	-0.013	0.026	0.613
Age	0.021	0.032	0.528
Training in agriculture	0.011	0.021	0.596
Labour	0.010	0.010	0.315
Cattle	0.010	0.012	0.412
Off farm employment	-0.058	0.026	0.027
Maize area	-0.026	0.018	0.164
Tobacco area	-0.006	0.024	0.802
Price	0.865	0.034	0.000
Expenditure on variable inputs	0.019	0.030	0.531
Yield kg/ha	1.001	0.011	0.000

R Square 0.907.

From break even analysis, the margin of safety in tobacco production was more than 50%. This implies that, tobacco will remain relatively profitable even at lower yields and prices. This notion has also been supported by Rukuni (2006), though on large scale farming. For large scale commercial farmers' tobacco was observed to offer good financial returns even after a large drop in yield and price and would continue to be attractive even under progressively difficult conditions.

#### **Determinants income earnings from tobacco production**

It was also revealed from the study that, the majority of the respondents (75%) were full-time farmers, while others engaged in other occupations apart from farming and there was a negative correlation between off-farm employment and tobacco income. The finding of the study is consistent with Deiniger and Olinde (2001) who, studying data from Colombia found that, specialisation in either farm or non-farm activities increased wealth and income levels. However, this is not consistent with general findings in Africa that households that engage in both agricultural and non-agricultural activities are richer, both in income flows and in endowments of assets (Piesse et al., 1999). Diversification caters for livelihoods security, by spreading risk and uncertainties of agriculture; it however compromises on time allocation on various farm enterprises especially for high value crops like tobacco.

Leaf quality and yield had a significant positive effect on tobacco returns. Total revenue from a cropping enterprise is a product of yield and price. Leaf quality for tobacco is reflected in the price per kg achieved. Smallholder farmers achieving higher prices and high yields therefore achieve better returns. Yield and quality depend on good agronomic practices, proper curing and

minimisation of post harvesting losses and leaf spoilages.

Age of the household head had the expected effect (negative sign) on tobacco farm returns, implying that, younger tobacco farmers had more income than older farmers. Though not significant the notion of age being negatively correlated to performance is however supported in literature. Yaron and Dinar (1992) argued that, old aged farmers generally tend to resist change than young farmers who quickly adopts new appropriate technology. Training in agriculture as expected was positively correlated to tobacco revenue though not significant at 5% level. Similar conclusions were also observed by Mutandwa et al. (2008), who in an attempt to ascertain whether training in tobacco farming influences tobacco yields and returns among smallholder farmers concluded that, returns for trained farmers were greater than untrained farmers though statistically insignificant.

#### **Conclusions**

Gross margin analysis revealed that, tobacco production is a viable smallholder enterprise, and therefore has potential to contribute towards improving incomes and livelihoods of rural small scale farmers in Zimbabwe. From break even analysis, tobacco will remain relatively profitable even at lower yields and prices. The study therefore concluded that, farmers should consider tobacco production as a crop of choice as it is a viable crop and its returns remains favourable under diverse conditions.

All the farmers reported to be using firewood in tobacco curing. This brings about questions regarding long run sustainability of smallholder tobacco production. Deforestation implies switching over to coal and electricity for tobacco curing. In the long run, small scale tobacco production costs are therefore expected to rise and profitability will decline. There is therefore need for

government intervention to raise awareness about the negative effects of deforestation. Apart from enforcing environmental protection laws, there is need to ensure each tobacco farmers establish replacement wood lots.

The observed negative significant relationship between off farm employment and revenue from tobacco reveals that, farmers in formal employment are not productive. There is therefore need for government policy reconsiderations in land allocations, and input support to prioritise productive full time farmers. To improve income earnings from tobacco, there is also a need for farmers, government and other interested stakeholder to focus on improving yield and quality of the crop for better prices. There is also a need to strengthen education, extension, research and development of appropriate technologies for smallholders given that previous research and development efforts were targeted on large scale farming.

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