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An Analysis of the Profitability of Groundnut Production by Small-holder Farmers in Chegutu District, Zimbabwe

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Abstract
This study analyzes the viability and profitability of groundnut production by smallholder communal farmers in Chegutu district. A gross margin budget was used to compute the gross rate of return (GRR), and found to be 0.45. Proxing for fixed costs, net profit was computed and a net rate of return (NRR) of 0.31 was found. Multiple regression analysis was used to determine the socio-economic factors affecting profitability of groundnut production. Family size, level of formal education, land size and access to loans were all statistically significant with R^2 value of 72%. The major constraints were inadequate labour, high input costs, aflatoxin, poor extension services and poor access to loans. Groundnut is a profitable enterprise for smallholder farmers in Chegutu district. Smallholder farmers were encouraged to produce groundnuts at commercial level, use more modern inputs and explore commodity value addition.
Keywords: groundnut, profitability, aflatoxin, Chegutu

1. Introduction

Groundnut (*Arachis hypogaea* L.) is the 6th most important oil seed crop in the world and is also an important food and cash crop across Sub Saharan Africa (Tarawali and Quee, 2014). Mugisha *et al.* (2014) highlighted that groundnut serves two important uses, that is; household food and nutrition security, and income generation. Groundnut provides high quality edible oil used for making cooking oil, margarine and salads, easily digestible protein at between 26% and 28% of total groundnut mass. Oils and solvents from groundnut are used in medicines, textiles, cosmetics, nitro-glycerine, plastics, dyes, paints, varnishes, lubricating oils, leather dressings, furniture polish, insecticides and soap. According to Consultative Group for International Agricultural Research (CGIAR, 2013), groundnut provides half of the 13 essential vitamins for normal human growth and tissue maintenance, fats, protein carbohydrates and high quality fodder for livestock. For the impoverished communal dwellers, groundnut provides an affordable alternative source of protein. Peanut butter, its main product is important for women and children as an additive in many nutrition-rich relishes used in the home. Its by-products can be used as animal feed, bedding for chickens and manure. It is a rain fed crop in most parts of Zimbabwe although it can also be grown under irrigation. Groundnut crop ranks among the most desirable crop for rotation purposes with grass crops such as maize and wheat. It carries the nitrogen fixing qualities associated with legumes, hence its importance for soil fertility improvement, particularly in the semi-arid climatic conditions of sub-saharan Africa (Giller, 1991). If inoculated with rhizobium, the groundnut plant will fix nitrogen in the soil, thus reducing the need for expensive nitrogen fertilisers for subsequent crops. The crop grows well on deep, well drained sandy loam soils that are generously supplied with calcium and contain a moderate amount of organic matter (Ajeigbe et al. 2014). Groundnut is a tropical plant which thrives in a long warm season with well distributed rainfall of at least 500mm per season and a mean temperature range from 25^{o}C to 30^{o}C for optimum crop development (Taphee and Jen, 2015). The crop takes between 100 and 190 days to mature depending on variety (MAMID, 2011).

In Zimbabwe groundnut is more suitably grown in 3 agro- ecological regions, that is natural regions II, III and IV (N2 Africa, 2015). Groundnut is sold either as pods or kernels (grain) and hence prices vary between the two forms. Value-addition can be carried out by processing groundnut into peanut butter, roasted and salted nuts, or boiled nuts which fetch higher prices in the market. Activities along its value chain can be easily handled by women thus providing direct employment, income and nutritious food thus reducing diseases among children. Kagoro and Chatiza,(2012) affirmed that groundnut ranks among the most agronomically important food legumes grown in the semi-arid areas of Zimbabwe. Many families, both rural and urban rely on this crop, which is highly adapted to tropical and sub-tropical climates, for their livelihood and nutritional well-being(Asekenye 2012). Much of this crop is grown by small scale farmers, most of whom operate at the margin of subsistence. Groundnut plays a critical role in enhancing food security among poor rural households. As family consumption needs are met, a larger share of production is traded on both the domestic and regional markets. Increased production and productivity should lead to improved health, better incomes and better livelihoods for poor rural householders. In comparison with other crops, groundnuts are easy to value add into salted peanuts, peanut butter and related products for use in biscuit making, chocolates, sweets and many other confectionary products. Machinery needed to value-add groundnuts can be obtained locally and at a relatively

low cost. Every part of the groundnut plant is of value to the farmer; the kernel is the edible part, the groundnut hull can be used as manure, bedding for broiler and egg production, and also can be used as feed for cattle. Groundnut production can be a source of employment to rural dwellers, the combination of being labour intensive and having high returns indicating possible high levels of labour absorption. It is one crop which is directly linked to the health and nutrition status of an area's inhabitants, particularly women, children and the aged.

While in Southern Africa groundnut production is characterized by low productivity, low-input use and limited market access(Mathews et al. 2007), in developed countries, groundnut yield has been rising through the development, dissemination and efficient use of resources coupled with improved varieties whose yield range from 2.8 to 6.1 tonnes per hectare (Usman et al. 2013). In Africa in general, groundnut yields are still as low as 0.5 to 1.0 tonnes per hectare implying depressed output, hence considerable scope for improvement. This is in-spite of efforts by various research institutes such ICRISAT, CGIAR, N2 Africa and many others, on various aspects of production and improvement of the crop(Singh & Oswalt 1995).

According to Makuvaro *et al*. (2014), groundnut is a high-value crop with low cost inputs relative to other crops such as maize, wheat and tobacco. A high-value crop grown on relatively low cost inputs should translate into a profitable enterprise preferred by resource poor smallholder farmers. This however, does not appear to be the case, thereby raising questions about the seemingly common position. Communal farmers have not harnessed the potential benefits derived from growing groundnuts and there is need for research to clearly establish the viability or otherwise of the groundnut enterprise in order to assist farmers with enterprise choice decisions. Most research on groundnuts has been on breeding, soil management and agronomic practices of the crop, while little has been done on the viability and profitability of the enterprise. In the rural areas, the levels of unemployment and underemployment remain uncomfortably high for responsible policy makers. The groundnut enterprise is labour intensive and if viable, should reasonably fit into the rural set-up, providing the much needed employment for the unemployed active rural dwellers. Socio-economic factors that affect the viability and profitability of the groundnut enterprise are not easily apparent to rural dwellers(Usman et al. 2013). The small holder farmers are generally less knowledgeable and take these factors for granted. The extent of their influence if any, on profitability, need to be established through research.

Farmers have not grown groundnuts on a self sustaining basis where they can even chose groundnuts ahead of other crops, maize for example, in the knowledge that groundnut is more profitable even under un-supported conditions. In this case, the income earned from groundnuts will be able to secure enough food(maize) for more than a season, such that the argument to secure food by growing only maize is made redundant. Farmers have mostly gone into commercial groundnut growing only under contract where they are supported with inputs, technical advice and guaranteed markets. Yet proven profitability under normal smallholder operating conditions, and assuming a normal cost and pricing structure should help improve the independent and sustainable uptake of the crop by farmers, thus broadening their choice base and opening up ways for better and more efficient resource utilisation. This will help farmers move away from the narrow and often erroneous view that food security is guaranteed only through maize production. Maize can be bought from income obtained from other more profitable enterprises like groundnut, such that the comparative advantage from growing groundnut is exploited. The need to analyse the profitability of this enterprise and establish the factors that affect its profitability becomes even more compelling.

The main objective of the study is to determine the profitability of the groundnuts enterprise as currently grown in the communal areas of Chegutu district, as well as identifying household characteristics affecting its profitability, and constraints to growers

2. Methodology

2.1 Area of study

The study was carried out in Chegutu district, one of the 6 districts of Mashonaland West province, central-northern part of Zimbabwe. Chegutu district consists of communal settlements, small scale commercial farms, large scale commercial farms and an urban settlement, Chegutu town, 120 km south-west of Harare. The district spans over 3 different agro-ecological regions, region II (a), II (b) and III. Region II(a) receives average rainfall of 750-1000mm annually and has 18 rainy pentads. Intensive farming is practiced with crops and livestock as major enterprises. Region II(b) receives the same amount of rainfall divided into 16 to 18 pentads annually over good seasons. Region III receives an annual rainfall range of 650 to 800mm per season. Semi-intensive farming is practiced with livestock and crops such as maize, cotton and groundnut being grown. According to ZimStat, in 2012 the total population of Chegutu district was 153 655 persons, with a total land area of 5329.13km^2. The district has a total of 29 wards and an average household size of 4 people.

2.2 Data sampling, collection and analyses

Chegutu district was purposively selected for being the highest groundnut producing district in Zimbabwe and

for ease availability and access to information by the researchers. Out of the 29 wards in the district, 3 were purposively selected for the high concentration of smallholder groundnut farmers. Seven villages from each ward were randomly selected, and five households from each village were then selected, randomising via the random number table making up a total of 105 respondents. The sample frame constituted all smallholder groundnut farmers from the communal farming sector of Chegutu district. Primary data was collected from the 105 households for the 2015/ 2016 agricultural season using a structured questionnaire, which sought responses on farmer household characteristics together with crop production statistics. The head of the household was interviewed, and where absent a proxy privy to the pertinent household data was interviewed. Secondary data was collected from official government sources, past production records, books, journals, the internet and periodicals to reinforce understanding of the study area. Focused group discussions and key informant interviews were conducted with farmers and Agritex officials respectively.

2.3 Household socio-demographic characteristics

Summary statistics for descriptive measures of household behaviour were used to reveal the important trends and qualities of the sample that have a bearing towards households' general production decisions, groundnut production and marketing to determine both viability and profitability of the enterprise. Household attributes like age and sex of household head, family size, level of education, land size owned, access to extension education, access to loans, land area under groundnuts and income sources were assessed. Summarised and analysed information revealed minimum and maximum values, mean, and standard deviation values of the relevant variables and their influence on groundnut production and marketing, hence profitability. The SPSS software package was used for data analyses.

2.4 Gross margin analysis

Gross margin is the difference between gross output value and total variable costs for a particular enterprise per land area, for example per hectare (Ngunguzala, 2011). It is the most commonly used analytical instrument in determining the performance of an agro-based enterprise before a decision to commit resources is made. To construct a gross margin budget, physical budget of enterprise requirements is converted into financial terms by introducing monetary values for each of the physical items. Quantities of physical inputs, their monetary values and groundnut prices were obtained from the household survey. The gross margin budget is a tool to analyse viability of enterprises, to enable the objective selection of enterprises with better returns per hectare at the production planning stage, assuming fixed costs are evenly shared among all enterprises. Where fixed costs can be determined and subtracted, the Net Enterprise Income (NEI) can be determined, allowing for the calculation of the Net Rate of Return (NRR). Consequently two rates of return were computed that is; Gross Rate of Return (GRR) based on gross margin, and Net Rate of Return (NRR) based on Net Enterprise Income. In studies by Taphee and Jen (2015) on the profitability of groundnut production, the Gross margin budget was used as a proxy for profitability. This was justified from the understanding that a profitable enterprise should necessarily have positive gross returns, although this does not imply that all enterprises with positive gross returns will be profitable. The two indicators drawn from the Gross Margin Budget structure, and used for measuring viability and profitability are the GRR and the NRR respectively, and they are derived from the following formulae:

Gross Rate of Return (GRR)

$$GRR = \frac{Gross\ margin}{Total\ variable\ costs}$$

Net Rate of Return (NRR)

$$NRR = \frac{Net\ profit}{Total\ cost}$$

The gross rate of return gives the enterprise returns per each dollar invested in variable costs, and more strictly assesses enterprise viability; while the net rate of return (NRR) gives the net returns per each dollar of enterprise total cost and more suitably represents enterprise profitability (Rae,1977). While a positive gross margin is sufficient for enterprise viability, comparative enterprise ranking will select the enterprise with the highest gross margin ahead of one with a lower gross margin. A high NRR figure indicates a higher level of profitability and is therefore preferred. Where a predetermined desired rate of return is already set, it can be used as the cut-off rate, with enterprises with higher rates being accepted while those with a lower rate are rejected for unsatisfactory profitability. Or simply, profitability between enterprises can be directly compared and those with

a higher NRR figure selected first. The main limitation of this method is its failure to factor in the size of the invested amount (cost) since a 5% return can be higher in dollar terms, than a 20% return on different scope investments (Marx et al. 1998, Barry and Ellinger 2011).

2.5 Regression Analysis

According to Gujarati (2004) regression analysis studies dependence relationships between one variable, the dependent variable, and one or more other variables, the explanatory variables. Multiple regression was used to determine the influence of socio-economic variables (independent, X) on the profitability (dependent, Y) of groundnut production. The regression coefficient of each X variable provides an estimate of its influence on Y, controlling for the effects of all the other X variables(Dougherty 2007). The Gross Margin was taken as the dependent variable since it was a proxy for profitability on the groundnut production. The independent variables are shown in the table below. Several researchers (Usman et al. 2013, Tasvarei et al. 2014, Taphee and Jen 2015) selected an identical set of independent variables in their studies of profitability for different crops. The Statistical Package for Social Sciences (SPSS.16) was used to determine the relationship between the dependant variable and the independent variable by multiple regressing. The regression model used in this study is presented as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \mu$$

Where,
Y = Gross margin
β_0 = Intercept
X_1 = Age of head of household (years)
X_2 = Sex of the head of the household (1= Male, 2= Female)
X_3 = Marital status (1 = Single,2 = Married, 3 = Divorced,4 = Widowed)
X_4 = Family size of household(Number of people)
X_5 = Level of formal educational attainment (1 = None, 2 = Primary, 3 = Secondary, 4 = Tertiary)
X_6 = Size of landholdings in hectares
X_7 = Access to extension services
X_8 = Access to loans
μ = error term (represents the unexplained variation in the dependent variable)
The expected relationship between the regressor variables and the regressand in the model are given in the table below.

Table 1 Apriori expectations

Variable	Sign	Explanation
Age of head of the household	+	The older the farmer the more experience and knowledge on profitably producing groundnuts.
Sex of head of household	+	Groundnuts are regarded as a crop for women hence households headed by women are more likely to produce more groundnuts.
Marital status	+	Married farmers are likely to produce more due to the collective effort and joint decision making by married couples.
Family size	+	The larger the family the more the farmer produces due to a larger labour pool.
Level of educational attainment	+	The more educated the farmer is, the more the farmer is able to adopt new technologies hence higher yield.
Size of landholding (ha)	+	The larger the area put under groundnut production the more the output.
Access to extension	+	Farmer with access to extension is likely to realize higher yields because of good agronomic practices from extension support.
Access to loans	+	Access to loans leads to high output because of the availability of working capital.

3. Results and Discussion

3.1 Household Characteristics

Age of head of household was grouped into 4 categories with the youngest group 21-30 years constituting 12% of the sample, 31-40 years constituting 20%, 41- 50 years constituting 24% and the 50 years and above constituting 44% of the households, indicating a preponderance of elderly household heads among the surveyed farmers. This goes against the general national population age structure which reflects higher numbers for the younger sections of the population (Zimstat 2012). In this study the 20 years and below were disregarded since most household heads tend to be above this age group. It is the elderly that are more into groundnut production than the younger age groups. The finding indicates the low rating of groundnuts as a cash crop for income since the younger age groups who normally grow cash crops, grow less of it compared to their more elderly counterparts who prefer groundnuts for consumption purposes.

Sex of head of household among the sampled households 64% were male headed and 36% female headed

indicating that the majority of households are male headed with the minority being female headed. This correctly reflects the patriarchal structure of the Zimbabwean society where most families are male headed reinforcing the general belief that there is safety in marriage. This is in line with crop enterprise ranking among farmers whereby the groundnut enterprise is mostly ranked third or fourth indicating its low rating among the majority male headed households, as it is regarded as a women's crop.

Marital status of the head of the household indicated that 70% of the farmers were married, 10% single, 4% divorced and 16% widowed, reflecting the general make-up and structure of the rural Zimbabwean population where the majority are married with the minority (30%) being out of marriage for various reasons.

The **family size** ranged from a minimum of 2 to a maximum of 10 family members. The mean was 4.87 with a standard deviation of 1.7. Family size is important since it usually reflects the amount of immediate and unconditional labour available to the household for general farming activities and is indicative of the response capacity to peak labour demand corresponding with critical stages in crop development, and hence yield and net realisable enterprise income. The fact that labour still features as one of the key constraints faced by groundnut farmers in Chegutu means that groundnuts is a labour intensive enterprise and that labour is a key input in its production. This agrees with findings by other researchers like Usman et al. (2013) and Ajeigbe et al. (2014), who indicated that labour was a key constraint in groundnut production in Nigeria.

Educational attainment had sampled farmers being grouped into 4 categories with 3% of heads of households not having received any formal education, 41% educated up to primary level and 50% secondary level, with the remaining 6% having attained tertiary education. This reflects the generally high literacy levels of the Zimbabwean population with only 3% not having received any formal education. This implies that efforts to commercialize groundnuts production through extension support programs will be well received since educated farmers easily appreciate beneficial change that improves their cropping and production methods to raise their incomes and wellbeing.

Land size under groundnut production ranged from a minimum of 0.2 hectares to a maximum of 2 hectares, with a mean of 0.614 hectares, and 1.5 standard deviation. This supports the view that groundnut production is regarded as a secondary enterprise for women, mostly coming after the staple maize which is given first priority. For most farmers, groundnut come as the second, third or fourth crop in terms of importance and land allocation. This is regardless of its profitability which ranks above that of maize and most other crops. This also reflects the family power structure where men make the most important decisions in family resource allocation, and they invariably allocate less land to enterprises run by their women counterparts like groundnuts, while allocating themselves more land for those enterprises championed by men like maize, cotton and tobacco.

Access to extension services indicated that of the sampled farmers, those who managed to have access to extension services were 57% , while 43% did not receive any form of extension support. This implies that there is need to improve extension coverage and also to upgrade the quality of extension education to include adaptive strategies in the face of increasing challenges occasioned by climate change.

Access to loans: Only 4% of the sampled households indicated that they had benefited from financial support in the form of loans while the rest, or 96% did not have access to credit facilities. This reflects on one hand, the limitation imposed by working capital availability, and on the other the traditionalism in groundnut farming where farmers still use the same old methods that do not use modern production inputs like certified seeds and inorganic fertilisers, both of which need some form of capital. This also represents another major impediment to efforts aimed at transforming peasant agriculture to modern commercial agriculture.

3.2 Viability and Profitability measures

The table below shows the cost and price ranges for inputs and outputs used in the determination of viability and profitability indicators for the groundnut enterprise.

Table 2 Summary of groundnut production profit and loss indicators per hectare.

Variable	Minimum	Maximum	Mean	Std. deviation
Price/ kg (USD)	0.60	1.76	0.95	0.68
Groundnut produced (kg)	250	1465	350.55	248.92
Seed cost (90kg/ha) (USD)	90.50	206.65	98.18	65.69
Land preparation and weeding	13.50	47.50	25.00	22.30
Fertilisers	0	45.00	32.65	22.69
Harvest labour	21.20	85.00	52.69	29.92
Agro – chemicals	0	0	0	0
Transport to the market	0	28.00	15.50	13.30

Source: Survey data 2016.

The table above highlights the major components of the gross margin budget for groundnut production by communal farmers in Chegutu district. The mean price of groundnuts is US$0.95 per kg and the standard

deviation is 0.68. Price varies depending on selected market and marketing channel. Farmers produced an average of 350.55kg per hectare with a relatively high standard deviation of 248.92. The seed cost averaged US$98.18 with a standard deviation of 65.69. Land preparation and weeding averaged US$25 per hectare, while fertilisers and harvest labour averaged US$32.65 and US$52.69 per hectare respectively. The standard deviation for land preparation and weeding was US$22.30 and that of fertiliser was US$22.69. Communal farmers in Chegutu district did not use chemicals for their groundnut crop.

To determine the viability and profitability of groundnut production, the average gross margin was calculated in the table below.

Table 3 Gross margin budget for an average smallholder farmer per hectare

Variable	**Costs/ Price (US$)**
Average production (kg)	350.55
Price/ kg	0.95
Gross income	**333.02**
Average variable costs	
Seed (90kgs @1.09/kg)	98.18
Fertiliser: Gypsum Compound D	0 32.65
Transport to market	13.30
Labour	
Land preparation and weeding	25.00
Harvesting	52.69
Agro-chemical	0
Variable costs	**221.82**
Miscellaneous (5% of TVC)	11.09
Total variable costs	**232.91**
Gross Margin	**100.11**
*Fixed costs	22.18
Total costs	255.09
Net Income	**77.93**
Rates of return	
Gross rate of return	0.45
Net rate of return	0.31

Source: Survey data 2016

*Fixed costs are estimated at 10% of total variable costs.j

From the table, an average gross income of US$333.02 is obtained per hectare. The average variable cost which consists of groundnut seed, fertiliser, and transport to market and labour amounted to a total of US$221.82 per hectare. The gross income, less the total variable costs inclusive of miscellaneous costs yielded a gross margin of US100.11. Computing fixed costs for the groundnut enterprise for smallholder farmers was not feasible, hence estimation was done based on 10 percent of variable costs (MAMID, 2011) as affirmed by Tatsvarei et al. (2014). This resulted in fixed costs of US$22.18 and hence a total cost of US$255.09. The average Net Income per hectare was US$77.93. The computations show that the GRR is US $0.45 which means every dollar of variable costs earns a gross return of 45 cents. The NRR was 0.31 which means every dollar of total costs earned a net return of 31 cents.

The results indicate that groundnut production was profitable with a positive average gross margin of US$100.11 per hectare and also a positive Net Income of US$77.93. This was supported by a Gross Rate of Return of 0.45 and Net Rate of Return of 0.31 which were quite significant in the profitability of the enterprise. A rate of return above zero is desirable, that is it attracts potential growers in the short run, however in the long run the rate of return has to be above US$1 to show attractive returns and also highlighting the potential for further growth. Groundnuts showed positive returns when the average yield of farmers was way below the international average yield of up to 7000kg per hectare. This shows that there is immense potential for improvement.

3.3 Regression analysis

Results from multiple regression analyses indicate both the magnitudes and direction of influence of the regressor variables on the dependent variable (gross margin) as used in the model.

Table 4 Coefficients of the regression model

	Standardised Coefficients		Sig. (95 % confidence interval)
	Beta	**Std. Error**	**p-value**
(Constant)	3.479	76.471	0.036
Age of the head of the household	0.129	6.310	0.031
Sex of head of the household	0.049	15.647	0.112
Marital status of the head of the household	0.080	8.823	0.080
Family size	0.402**	3.680	0.284
Level of formal education attainment	3.197**	10.073	0.307
Size of landholding in hectares	0.438***	4.299	0.357
Extension services rendered per household	0.066	11.617	0.025
Access to loans per household	-0.011*	28.454	0.031

***Significant at 1%; **Significant at 5%; *Significant at 10%.
Source: Analysis results 2016

The predictive power of the model represented by R^2 was 0.716, meaning the independent variables explained up to 72% of the variation in the dependent variable, which is adequate.

Size of landholding was found to be the most significant variable, (Part correlation= 0.357, $p < 0.01$, B = 0.438; Table 4) and is significant at 1%. This means increasing the size of acreage under groundnuts production by one unit would increase the gross margin by 36%. This can be attributed to economies of scale in production. This also agrees with the a-priori model prediction (Table 1) which predicts a positive relationship between the variable and gross margin. However, according to a study on cowpeas production by Zulu (2011) land size had a negative beta value and that was attributed to less efficient use of land as the land size increased, thus getting a lower yield per hectare planted.

Level of educational attainment was statistically significant at 5%, (Part correlation = 0.307, $p< 0.05$, B= 3.197; Table 4), explaining 31% of the variation in groundnut gross margin. This means that educated farmers were likely to achieve higher yields than the less educated, resulting in a higher gross margin. They are likely to quickly adopt latest agronomic practises and technologies unlike the poorly educated who may stick to outdated traditional methods of cultivating groundnuts. This is also in line with the a-priori prediction (Table 1). In their study on groundnut production, Usman et al. (2013), found the level of education to be significant, also affirming the implication that educated farmers are quick to adopt new technologies and methods of production ultimately increasing profitability. Contrarily, Tatsvarei et al. (2014), found the level of education to have a negative effect on the profitability of tabasco chilli by smallholder farmers in Nyanga.

Family size was also found to be significant at 5% (part correlation = 0.284, $p < 0.05$, B= 0.402; Table 4) with variation in family size explaining up to 28% of the variation in the gross margin of groundnuts. The size of the family means availability of labour and hence high productivity leading to high gross margin. Those households with fewer members have lower gross margins, hence a positive relationship between gross margin and family size. This agrees with the a-priori model prediction (Table 1). However in Tanzania, Katundu et al. (2013), found that the family size was not statistically significant and a weak predictor of yield, though the beta value was positive. In a study in Nigeria by Ekunwe et al. (2013), the family size had negative beta value contrary to the findings in this study. This can be attributed to differences in relative labour supply and demand conditions in the agricultural sectors of the different countries.

Access to loans was also significant at 10% (Part correlation = 0.031, $p < 0.1$, B = -0.011; Table 4). The beta value was negative, attributable to famers who did not have access to loans and this finding is the same as findings by Katundu et al. (2013). Access to loans avails working capital to farmers thus raising resource productivity. Access to loans was cited by 96% of sampled farmers as a major constraint in their operations. This was also in agreement with the model's a-priori prediction. This finding is also in line with Usman et al. (2013) and Mukhtar et al. (2014), who concluded from their studies that funds constituted a major constraint in agricultural productivity.

Age of head of household, sex of head of household, marital status and extension services were not significant in this model. However their beta values were positive meaning they had a positive effect on the gross margin. Using the multiple regression to highlight the significant variables results in re-statement of the model as follows:

$GM = 0.402\ X_4 + 3.197\ X_5 + 0.438\ X_6 - 0.11\ X_8$

GM = Gross margin

X_4 = Family size of the household (Number of people)

X_5 = Level of formal educational attainment (1 = None, 2 = Primary, 3 = Secondary, 4 = Tertiary)

X_6 = Size of landholdings in hectares

X_8 =Access to loans

3.4 Constraints faced by farmers

Table 5 Percentages showing constraints faced by farmers

Constraint	Percentage of farmers (%)
Poor access to loans	96
High cost of input	87
Inadequate labour	66
Aflatoxin challenge	54
Poor extension services	43

Source: Survey data 2016

The most common constraint (96% of farmers)was found to be the shortage of loan funds. This indicates that while most farmers do not use modern inputs like certified seeds and fertilisers which are bought from commercial input suppliers, it is because they do not have funds to enable such purchases. They may also suffer from labour shortages during peak labour periods and they do not have the capacity to pay for hired labour. This was due to the reluctance of financial institutions to issue loans to communal farmers because they do not have collateral security, they have high probability of defaulting loan repayments and also high transactional costs. The next most important limitation(87% of farmers) still relates to funding and indirectly manifests as high cost of inputs. Again this means that farmers have problems acquiring the inputs they need for crop production because the inputs are priced beyond their means. Inadequate labour represented the third most important constraint with 66% of the interviewed farmers citing it. The shortage of labour can be attributed to other competing enterprises such as maize, tobacco, roundnuts and also cattle herding which tend to exert pressure on family labour. The aflatoxin challenge which was cited by 54% of the farmers interviewed, came in as the fourth most important problem faced by farmers. According to Asekenye (2012), aflatoxin affected the majority of farmers in Uganda and Kenya to the extent of affecting the exportation of groundnuts to foreign markets. However, good agricultural practices at planting, harvest, post-harvest, and processing can reduce aflatoxin contamination. Poor extension was a problem to 43% of the sampled farmers meaning that the majority (57%) did not consider it as a problem, confirming the view that farmers erroneously consider groundnuts as a relatively easy crop to grow even without ant technical assistance.

4. Conclusion

Most of the households in the study area were into groundnut production and used family labour. The average gross margin was US$100.11, the average variable cost was US$221.82 and the average fixed cost was US$22.18. The GRR and NRR were 0.45 and 0.31 respectively indicating a viable and profitable enterprise.

Family size, size of landholdings, level of education and access to loans were significant in affecting groundnuts profitability in a positive way as shown by the positive coefficients. Age, marital status, sex of head of household, and access to extension services were found to be statistically insignificant. Access to loans affected profitability in a negative way because the smallholder farmers did not have access to this resource and for this reason, could not use modern inputs like certified seeds and fertilisers in production and could not engage paid labour. The overall model was significant at $R^2 = 72\%$, implying strong explanatory power by the independent variables. The results obtained were consistent with various other studies on profitability of crops.

Groundnut, as currently produced by smallholder farmers in Chegutu is a profitable enterprise. However, to increase profits from the enterprise, farmers need to increase their acreage devoted to groundnuts, improve production planning especially availing sufficient labour at critical points, improve their education to better appreciate modernization in production, secure additional funds through working capital loans, use more modern inputs and attempt a more commercial orientation in their practices. Policy makers should craft policies that promote groundnut production by communal farmers by reviewing the credit policy and accommodating communal farmers in sourcing finance. There is need to incentivise groundnut production as a way of encouraging communal farmers to view the crop as a profitable enterprise, and to better appreciate its additional value in improving soil fertility especially when planted in rotation with the staple maize crop.

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