

# AN ASSESSMENT OF PROFITABILITY OF GROUNDNUT PRODUCTION USING GROSS MARGIN, THE CASE OF NDHIWA SUB COUNTY, KENYA

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**Abstract:** Groundnut (*Arachis hypogea* L.) is a major annual oilseed crop and its economic makes the crop a beneficial enterprise for rural farmers in Ndhiwa Sub-County. With the constraints on land due to increased population and emergence of other enterprises such as sugarcane farming, groundnut remains a dominant crop in the area and continues to play a critical role as a source of income to the rural farmers. The study focused on profitability of groundnut production in Ndhiwa Sub-County, Kenya. Purposive, multistage and simple random sampling was used in the study. Data on production characteristics of farmers, groundnut yield levels, total input costs (variable) and revenues earned were obtained from 323 farmers and analyzed. Document analysis was used to collate and analyze secondary data. The operational cost and returns of groundnuts production were determined through Gross Margin (GM) and return on investment analysis. Secondary and primary data collected was collated, cleaned and coded for electronic entry and analysis. Groundnut was mainly grown in small scale with the average area under groundnut being 0.32 ha under. The average gross income from groundnut production was KES 34,268 per hectare from a mean output of 659 kilograms. Groundnut was found to be profitable in the area since it had a positive gross margin.

**Keywords:** Profitability, groundnut and gross margin.

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## 1. INTRODUCTION

The agriculture sector plays a significant role in the economies of developing countries, especially in Sub Saharan Africa (World Bank, 2008). Agriculture accounts for a large portion of Kenya's Gross Domestic Product (GDP) with an estimated 75% of the population depending on it either directly or indirectly. Majority of this population (80%) live in the rural areas and depend almost entirely on agriculture as a main source of employment and income To alleviate poverty and enhance economic growth, higher preference should be given to the sector (Republic of Kenya, 2010).

Groundnut is the 13<sup>th</sup> most important food crop and 4<sup>th</sup> in oil seed crop of the world. Groundnut seeds (kernels) have a variety of uses both as the nut and from by-products at home and in agro-processing industries. The varied uses of groundnut plant make it an excellent cash crop for domestic markets as well as for foreign trade in several developing and developed countries (Food and Agriculture Organization, 2006).

Worldwide, groundnut is grown on 26.4 million hectares with a total production of 37.1 million metric tons and an average productivity of 1.4 metric tons /ha. Developing countries constitute 97% of the global area and 94% of the global production of this crop. In East Africa, many farmers and urban consumers rely on groundnut, which is highly adapted to tropical and sub-tropical climates, for their livelihood and nutritional well-being. It is widely grown by small-scale farmers as main crops, relay crops or inter-crops and production is rain fed (Mutegi, Hendriks and Jones, 2012). Groundnut (*Arachis hypogea* L) is widely grown and used by small scale farmers both as a food crop and to generate income. Farmers rely on groundnut, which is highly adapted to tropical and sub-tropical climates, for their livelihood and nutritional well-being.

Kenya's import bill has groundnut as one of the major vegetable oils imports. (Ministry of Agriculture, 2012). In Western Kenya groundnut is a major source of small-holder cash income and plays a critical role in attaining food security among poor rural households (Mutegei *et al.*, 2012).

Groundnut is ranked as fourth most suitable crop for the semi-arid areas of Kenya and has multiple uses in the food industry. In 2012, the area under groundnut was 16,387 ha with a production of 11,639 tons valued at KES 965.9 million. The leading groundnut producing counties by value are Homa Bay (44.75%), Migori (14.61%), Bungoma (11.38%), Meru (5.7%), Busia (3.7%), and Siaya (1.7%). Other counties producing peanut are Kisii, Baringo, West Pokot, Kisumu and Bomet (ROK, HCDA and USAID, 2013)

Ndhiwa Sub-County is located in Homa Bay County in South Western Kenya and is one of the major groundnut producing zones locally and nationally. Groundnut is one of the main cash crops grown in the Sub-County. With the declining area of arable land due to population pressure, it remains the best option as a cash crop in the region despite the emergence of sugarcane and cotton (MOA, Ndhiwa Sub County, 2014).

During the 2014 crop year, a total of 19,900 farm families planted groundnuts in 5,590 hectares yielding a total of 3,913 MT of shelled nuts valued at KES. 391.13 Million. Out of this 30% was consumed at the household level, 60% sold unprocessed and 10% was processed within the Sub-County. The average production per hectare was 700 kg against a potential of 1,400/hectare. Production of groundnut has been low in terms of yields realized by the farmers in the Sub-County (MOA Ndhiwa Sub County, 2014).

At the farm level, the basic objective of economics of agricultural production is to assist farmers maximize profits through efficient farm allocation of resources over a given time period. Profit maximization could be achieved by maximizing output from given inputs. Agricultural productivity or output is synonymous with resource productivity which is the ratio of total output to the inputs being employed (Nand, Virupax and Charles, 2010). Most research on groundnut in the study area have focused on improvement production through technology improvement in seed varieties, pest and disease control, value addition and post-harvest management. Other studies have focused on production related factors, but no studies were found that focused specifically on profitability of groundnut farming in the study area.

The results of this study are useful to farmers and extension service providers in making decisions on resource allocation to various enterprises.

The study focused on profitability of groundnuts as a key cash and food crop in the region. The specific objectives of the study were:

1. To determine the profitability of groundnut production in the study area
2. To identify the problems faced by groundnut farmers in the study area.

The research questions that the study sought to answer were

- Is groundnut production profitable in the study area?
- What problems do groundnut farmers face in the study area?

The cost and returns of groundnut production was assessed through Gross Margin (GM) and return on investment analysis. The gross margin is a dependable analytical tool in determining profitability of farm enterprise. It is very useful where fixed capital is a negligible portion of the farming enterprise and is defined as the difference between gross farm income and the total variable cost.  $Gross\ Margin = Gross\ Income - Total\ Variable\ Cost$  (Olukosi and Erhabor, 2005). Some of the merits of gross margin are that it is highly applicable to subsistence system of farming involving small fixed capital component and it is easy to compute and interpret.

Return on investment was calculated as  $Gross\ Margin / Total\ Variable\ cost$ .

The model was expressed as follows: (Girei *et al.*, (2013)

$Gross\ Margin\ GM = Total\ Revenue\ (TR) - Total\ variable\ Cost\ (TVC)$

$Net\ Farm\ Income = Gross\ Margin - Total\ Fixed\ Cost$

## 2. METHODOLOGY

### Research Design:

The study adopted case study research design, which was a deliberate attempt to collect data from members of population in order to determine current status in respect to one or more variables (Mugenda and Mugenda, 2003). This design was adopted since the population studied was too large (21,820) to observe directly and hence it was appropriate to take a sample and generalize for the whole population

### Location of study:

Ndhiwa Sub-County was chosen due to its importance as one of the major groundnuts producing zones in Kenya and in Homa Bay County. Groundnuts production was chosen due its importance as a cash crop in the Sub-County. Ndhiwa is located within Homa Bay County in South Western Kenya. It covers 711 Km<sup>2</sup> with arable land estimated at 638 Km<sup>2</sup> (63,800 ha) Altitude ranges between 1200 m to 1400 m above sea level with Vertisols, Nitosols, Luvisols, Andosols and Gleysols the types of soil existing. Administratively, the Sub-County is divided into six divisions including Riana, Ndhiwa, Nyarongi, Kobama, Pala and Kobodo with a population of 172,212 persons as per the 2009 population census. There are 33,410 farm families according to The Kenya National Bureau of Statistics, Population and Housing Census, 2010.

Ndhiwa has a bimodal rainfall pattern (long rains Feb to May; 500-1000mm pa, 60% reliability, short rains Aug-Nov; 250-400 mm Pa., 50% reliability) with an average range of between 500mm-1650 mm per year. Groundnuts are mainly grown in four divisions of Kabama, Ndhiwa, Pala and Nyarongi by small-scale farmers in four divisions as secondary crops, relay crops or inter-crops of maize or sorghum and production is rain fed. During the 2014 main season, area under groundnut was 5,590 hectares yielding a total of 3,913 MT of shelled nuts valued at KES. 391.13 Million. The average production per hectare was 700 kg against a potential of 1,500/hectare. (MOA, Ndhiwa Sub-County 2014).

### Target Population:

Olive and Abel (2003) define a target population as consisting of a people or objects to which we generalize the results of our investigation. The target population for this study was 21,820 which was the total number of farm families in the four divisions according to MOA (Ndhiwa Sub-County) reports.

### Sampling design Procedure:

Purposive, multistage and simple random sampling was used in the study. Ndhiwa Sub-County was purposively selected because it is one of the groundnut rich producing zones in Kenya. The Sub-County was stratified into administrative divisions. The four major groundnut producing divisions were selected; Ndhiwa, Kobama, Pala and Nyarongi. The sampling population for this study was the total number of farm families in the four divisions which was given as 21,820.

Sample proportions per division were determined based on number of farms per division, with division with the highest number of farms taking the highest

The sampling frame was obtained through consultation between the researcher and stakeholders who gave locations of groundnuts growing households. A sample was drawn and the total number of households interviewed in location was determined through proportional allocation and respondents drawn through systematic random sampling. Interviews were conducted to 323 household heads and or the spouses for

The formula below was adopted since the target population of 21,820 was greater than 10,000 Olive and Mugenda (2003).

$$n = \frac{Z^2(1-p)p}{e^2}$$

*n*- The desired sample size.

*Z*- The standard normal deviate at the required confidence level.

*p*- The proportion in the target population estimated to have characteristics being measured.

*e*- The level of statistical significance test.

The table below shows proportionate allocations for respondents per division.

**Table 1. Proportions of respondents by division**

Division	Proportion of farm families to total	Number of respondents
Kobama	26.3%	85
Ndhiwa	29.4%	95
Pala	24.9%	80
Nyarongi	19.4%	63
<b>Total</b>	<b>100</b>	<b>323</b>

**Research Instruments:**

Data was collected using two instruments:

**Questionnaires:**

The questionnaires was prepared and administered on respondents by the researcher through face to face interviews. The questionnaire was used to collect primary data on costs of production, revenues, yields and challenges faced by farmers

**Content Analysis:**

Content analysis was used to collect data on background information on the study area, literature on past study findings and review of relevant literature on methodology. Note taking was used to record the information gathered.

**Pilot case study:**

To ensure reliability of the research instruments, piloting was done among 40 farmers in the area who had similar characteristics. Cronbach alpha coefficient was used to determine reliability coefficient. A coefficient of 0.809 was obtained, which was considered adequate hence the instrument was adopted after corrections based on findings from the pilot study.

**Data collection procedures:**

As a national requirement for all research a research permit was obtained from the National Commission of Science, Technology and Innovation (NACOSTI) through an introductory letter from the Graduate School, University of Kabianga before the research was carried out. A reconnaissance survey was done in Ndhiwa Sub-County to familiarize with the area and groundnut production. Data was collected using a structured questionnaire administered to through face to face interviews to 323 respondents

**Data analysis and presentation:**

Data was entered into SPSS version 20 cleaning and analysis. The data was subjected to descriptive analysis such as means, modes, standard deviation and frequencies. Correlation matrix was used to eliminate highly correlated data.

**3. RESULTS****3.1 Groundnut production:**

Production for the year 2014 was the dependent variable. The average area under groundnuts was 0.87 acres (0.35 hectares) with the lowest being 0.25 acres (0.1 hectares) and the highest 7 acres (2.8 hectares). Production averaged 263.58 Kg/acre (659 Kg/hectare). On average, the households earned a gross income of KES 13,531 for 0.87 acres (0.35 hectares) under groundnuts during the 2014 main season. The lowest gross income was KES 2,100 and the highest was KES 171,000. Table shows the findings for groundnut production of the year 2014 main season.

**Table 2. Groundnut production in the year 2014**

Statistic	Area in acres	Quantity- Kg of dry shelled	Gross income in KES
Mean	.87	264	13,532
Median	.75	190	10,000
Mode	.50	100	10,000
Std. Deviation	.68	315	16,848
Minimum	.25	40	2,100
Maximum	7.00	2,850	171,000

Table 2 shows that the earnings compare well that from all other crops that the household grew combined which earned a minimum of KES 280, a maximum of KES 390,000 and an average of KES 28,433. The production of groundnut for the 2014 season was used for the gross margin calculations.

Analysis by divisions showed that Ndhiwa had the highest mean gross income at KES 16,825 while Nyarongi had the lowest at KES 10,512. Kobama recorded a mean of KES 12,539 while Pala had KES 12,847. It's only in Ndhiwa where the mean was higher than the Sub-County mean. Pala had both the lowest and the highest gross incomes at KES 2,100 and KES 171,000 respectively. The mean quantity produced was lowest in Nyarongi at 201 kilograms and highest in Ndhiwa where 338 kilograms was reported. Production in Kobama division averaged 257 kilograms and Pala 231 kilograms.

Table three gives the analysis by division

**Table 3. Production of groundnut by division**

Division	Statistics	Area in acres	Quantity –Kg of dry shelled	Gross income in KES
Ndhiwa	N = 95			
	Mean	1.18	338	16,825
	Median	1.00	250	12,000
	Mode	0.50	200	10,000
	Std. Deviation	0.99	355	17,737
	Minimum	0.25	50	2,500
	Maximum	7.00	2,400	120,000
Nyarongi	N= 63			
	Mean	0.77	201	10,512
	Median	0.50	175	9,000
	Mode	0.50	150	4,000
	Std. Deviation	0.36	101	5,366
	Minimum	0.25	50	2,500
	Maximum	2.00	510	28,560
Kobama	N = 85			
	Mean	0.84	257	12,540
	Median	0.75	180	9,600
	Mode	0.50	150	10,000
	Std. Deviation	0.55	219	10,962
	Minimum	0.25	45	2,250
	Maximum	3.00	1,400	70,000
Pala	N=80			
	Mean	0.64	231	12,848
	Median	0.50	100	6,580
	Mode	0.50	60	3,000
	Std. Deviation	0.36	428	24,630
	Minimum	0.25	40	2,100
	Maximum	2.00	2,850	171,000

### 3.2 Gross margin and return on investment:

Gross margin for groundnut production in the study was calculated based on the average yields, price and costs for the 323 respondents. Table 4 gives the Gross margin.

**Table 4. Gross Margin for groundnut production in Ndhiwa Sub-County, September 2014**

<b>Gross Revenue</b>	<b>Amount</b>
Average yield of groundnut (Kg/ha)	659
Average price of groundnut (KES/Kg)	52
<b>Total revenue (KES)</b>	<b>34,268</b>
<b>Variable costs</b>	
○ Land preparation	5,000
○ Seed (48 kg @100/=)	4,800
○ Planting (20 MD@ 100/=)	2,000
○ Weeding (20MD@ 100/=)	2,000
○ Harvesting (Digging and stripping) 20MD@100/=	2,000
○ Shelling and drying (20MD @ 100)	2,000
○ Marketing costs ( Packaging, transport)	1,200
<b>Total Variable Cost (KES)</b>	<b>19,000</b>
<b>Gross Margin (KES/ha)</b>	<b>15,268</b>
<b>Total Fixed Costs*</b>	<b>2,360</b>
<b>Net Farm Income</b>	<b>12,908</b>
<b>Return to KES invested</b>	<b>0.71</b>

- \* Fixed costs is average; include proportionate depreciation for farm implements.
- \* Return to KES invested = Net farm Income/Total Cost of Production

**Cost Benefit Ratio = GM/TVC: 15,268/19,000 = 0.80 or 80%**

From the data in Table 4 it is clear that groundnut farming is profitable in the area since gross margin is positive. The bulk of the costs applied in gross margin calculations are based on opportunity costs since most of the farmers use family labor for their farm operations. If no costs were assigned to the “free” inputs, the gross margin would be higher.

The calculated gross margin was based on average costs, implying that it applies to level two of management. Growers at lower levels could earn lower incomes while those at higher level could earn more at the given prices. Based on divisions, Ndhiwa had the highest Gross Margin at KES. 23,063, followed by Pala at KES 16,119, Kobama at KES 14,348 and Nyarongi had the lowest at KES. 10,280. Proximity of Ndhiwa division farmers to the major market in the area at Ndhiwa trading center could be one of the reasons for higher incomes from sales and hence higher gross margins.

The 80% cost-benefit ratio indicates a high rate of return for groundnut farmers in the study area.

### **3.3 Challenges Facing Groundnut Farmers:**

The farmers reported various challenges that face groundnut production in the study area.

Pests and diseases (17.6%), Low/declining production/productivity (10.9%), low prices during period of sale (15.2%), high production costs (7.7%), difficulty in weeding (7.2%), labor intensiveness (7.2%) and inadequate capital (6.1%) ranked highly in terms of frequency of responses concerning challenges facing groundnut farmers in the study area. Post-harvest losses (2.2%), lack of certified seed (1.6%), poor agronomic practices (1.1%) small land holdings (0.9%), lack of ready market (0.5%) and lack of credit facilities ranked lowly in terms of challenges faced in the study area. This showed that there are opportunities for groundnut farmers in terms of available markets, enough land for production and improvement of extension services so that growers can adopt improved seed and embrace credit facilities to increase operating capital for groundnut.

Table 5 summarizes the challenges identified by the farmers.

**Table 5. Challenges facing groundnut farmers**

Challenge	*Responses	
	N	Percent
Inadequate Capital	39	6.1%
Pests and diseases	112	17.6%
Low productivity/declining productivity/production	69	10.9%
Low prices during period of sale	97	15.2 %
Changes in weather	32	5.0%
Post -harvest losses	14	2.2%
Lack of certified seeds	10	1.6%
High production costs (land preparation, weeding, labor, shelling)	49	7.7%
Small land holdings	6	0.9%
Lack of extension services	27	4.3%
Poor infrastructure to markets	20	3.1%
Difficulty in shelling ( Labor intensive , and time consuming)	22	3.5%
Lack of ready market	3	0.5%
Poor agronomic practices	7	1.1%
Lack of credit facilities	2	0.3%
Difficulty in weed control	46	7.2%
Labor intensive	46	7.2%
High cost of seed during planting	34	5.4%
<b>Total</b>	<b>635</b>	<b>100.0%</b>

- \* Denotes multiple responses.

#### 4. CONCLUSION AND RECOMMENDATIONS

The study concludes that groundnut production is profitable in Ndhiwa Sub-County. Pests and diseases, low productivity and low prices during the period of sale were cited as the major challenges facing groundnut farmers (each was cited by more than 10% of the respondents). On the other hand, poor agronomic practices, small land holdings, and lack of ready markets and credit facilities were cited as minor challenges facing groundnut farmers (each was cited by less than 1% of the respondents). The availability of markets and land to expand production implies that groundnut production can improve in the area.

The study recommends developments of marketing infrastructure to enable farmers sell produce at better prices to earn more revenue. Farmers also need to increase area under groundnut.

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