COMPARATIVE COST - BENEFIT ANALYSIS OF FRESH AND SEED OKRO PRODUCTION AT KPANDO IN THE VOLTA REGION

BY

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THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF ARTS DEGREE IN AGRICULTURAL ADMINISTRATION

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DECLARATION

I, SAMUEL SAKYI OWUSU, author of this dissertation "COMPARATIVE COST - BENEFIT ANALYSIS OF FRESH AND SEED OKRO PRODUCTION AT KPANDO IN THE VOLTA REGION", do hereby declare that, with the exception of ideas and quotations which have been duly acknowledged, the work presented in this dissertation was done entirely by me in the Department of Agricultural Economics and Agribusiness, University of Ghana, Legon, from September 2001 to December 2002.

This work has never been presented either in whole or in part for any other degree in this University or elsewhere.

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(STUDENT)

This dissertation has been submitted for examination with my approval as supervisor.

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MR D. P. K. AMEGASHIE

(SUPERVISOR)

DEDICATION

TO THE OWUSU FAMILY

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ABSTRACT

Okro is an important crop in the diet of many Ghanaians and the economy of Ghana. Fresh okro contains some amount of protein, carbohydrates, vitamins A and C with traces of B vitamins, as well as calcium phosphorus and iron. The problems of removal of subsidies on agricultural inputs, poor market price of fresh okro, and nematode problem had resulted in low net income from fresh okro enterprise. Although Ghana has a high potential of producing both fresh and seed okro, most farmers are currently in the production of fresh okro. Farmers take into consideration the relative profitability of alternative enterprises open to them before selecting those to invest in. This present study compares the costs and benefits as well as the profitability of fresh and seed okro production. Data were collected through the use of structured questionnaires administered to ninety farmers. The profitability of the enterprises were compared, using net income, benefit-cost ratio, and return on sale concepts. Sensitivity analysis was carried out to take care of risk and uncertainties on the conclusions drawn on the acceptability of the enterprises. The study revealed that fresh production cost lesser than seed okro production per unit. Although both fresh and seed okro production are profitable, seed okro production is more profitable than fresh okro in the rainy season. Dry season fresh okro fruits production reaps higher returns than rainy season fresh okro fruits production. Major constraints in okro production are attributed to increasing pests and diseases, high cost of agro-chemical and poor market price. In the light of the above findings of the present study, it was recommended that extension education be intensified eradicate the major constraints to okro production so as to increase the net income.

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LIST OF ABBREVIATIONS

MOFA	Ministry of Food and Agriculture
>	Greater than
=	Equals
sp	Species
Σ	Summation
N.P.K.	Nitrogen, Phosphorus, and Potassium
DF	Discount factor
Ben.	Benefit
Red.	Reduction
Std. Dev.	Standard deviation
C Var.	Coefficient of variation

CHAPTER ONE

INTRODUCTION

1.1 Background

Okro (*Abelmoschus esculentus*, (L) Moench), originated from Tropical Africa and was taken to other parts of the world by the Portuguese (Purseglove, 1986; Sinnadurai, 1992). It belongs to the Malvaceae family. The Americans call the crop okra, and is called ladies finger by the British (Sinnadurai, 1992). In Ghana okro is one of the most widely grown vegetables. The crop grows well throughout the year in West Africa, producing good yields if the soil is fertile and there is sufficient moisture in the soil (Thompson and Kelly, 1957). It is a very important crop in the diet of many Ghanaians and hence its importance in the economy of Ghana. Nutritionally both the leaf and fruits are eaten as vegetables. The leaves are used as spinach. Fresh okro is used in the preparation of stew and soup in Ghana and throughout West Africa. The fresh fruits contain some amount of protein, carbohydrates, vitamins A and C with traces of B vitamins. It is also a good source of calcium, phosphorus and iron. Roasted and ground seeds are used in cooking and for edible oil extraction (Martin and Roberte, 1978). In Ghana, almost every agricultural commodity has become a potential export crop because of the effort to narrow the gap between the traditional export crops like cocoa and coffee, and food crops (MOFA, 1990). Government effort to promote non-traditional exports started as far back as 1960 (Dzokoto, 1990). Recent decline in world price of traditional crops has made the government to encourage farmers to diversify into the production of non-traditional crops like okro, pineapple, pawpaw, and mango, among others.

1.2 Problem Statement

The construction of the hydroelectric dam at Akosombo affected the people of Kpando. Their standard of living reduced due to destruction of their farms, and other dam-induced losses. The Kpando Irrigation project was therefore initiated to assist farmers who had suffered dam-induced losses during the construction of the dam to earn extra income. Okro is one of the crops cultivated in the area. High quality seeds are needed for the cultivation of okro so as to obtain high yield of okro fruits. Sometimes, seed required for planting is obtained from the previous harvest, a practice that is generally unacceptable since it generates into impure seeds with reduced quality as compared with the original seeds. The output or yield of okro is affected by the quality of seeds used during planting. Poor quality seed used as a planting material will give rise to poor yield, and a good quality seed is likely to give rise to a good crop yield. A good quality seed is therefore needed for achieving a high yield of both fresh and seed okro. A good quality seed is one that has high viability (usually 85% and above), high vigour, free from seed borne diseases and free from noxious weed seeds (Dzietror, 1995). Although Ghana has a high potential of producing both fresh okro fruits and seed okro, in the rainy and dry seasons, most farmers are currently in the production of fresh fruits. During the period of glut for the fresh fruits, a farmer decides whether to sell at a reduced price or keep the fruits for seeds. Relevant data and analysis is needed before an investment decision could be made on the better alternative, that is, the production of fresh fruits or seed. The cost of project inputs keeps rising as a result of the macro-economic policy of removal of subsidies on agricultural inputs, coupled with the falling value of the cedi against the major currencies, such as the dollar and pound. With the problems of removal of subsidies on agricultural inputs, reduced area of production, declining yields, poor

market prices, pests and diseases, the present study addresses the following pertinent questions, in an attempt to identify the two options and compare their costs and benefits:

1. What are the costs of fresh and seed okro production?
2. What are the benefits of fresh and seed okro production?
3. How profitable is it to produce fresh and seed okro?
4. What factors militate against the production of fresh and seed okro?

1.3 Objectives of the Study

The general objective of the study is to compare the costs and benefits of fresh and seed okro production at Kpando in the Volta Region of Ghana.

The specific objectives addressed by the present study in order to achieve the general objective are:

1. To estimate the costs and returns of fresh and seed okro production.
2. To assess the relative profitability of fresh and seed okro production.
3. To identify the constraints militating against the production of fresh and seed okro.

1.4 Justification of the Study

Kpando district has been identified as a potential vegetable production area in the Volta Region that can be developed to increase supply of fresh okro to both domestic and export markets. Propagation of okro is by seed, and the supply of high viable seed for planting needs to be increased. High viable seeds are seeds with a germination percentage greater than 80%. Although Ghana has a high potential of producing both

fresh okro fruits and high viable okro seeds (Dzietror, 1995, Owusu, 1999), a greater quantity of high viable okro seed is imported. Investment in fresh okro fruits as well as seed okro production is therefore worth investigating.

The study will offer reliable information on the profitability of fresh and seed okro production to small-scale farmers. The determinants of crop profitability are yield of crop, price per unit of output, variable costs, labour and machinery cost (Bernard, 1990). Introduction of a new technology, variable cost reduction, and increasing price per unit of output are among the interventions geared towards increases in crop profitability. Investment in fresh and seed okro production is a matter of choice. Farm investment analysis should confirm that adoption of a new technology will really be financially worthwhile, for farmers can respond to financial incentives only when it is truly remunerative for them to do so.

The present study will also provide reliable information needed for farm planning by the small-scale risk-preferred, risk-neutral, and risk-averse okro farmer. Farmers live in a particular cultural and risk environment. Although a risk-neutral okro farmer could use only the profitability figures for farm planning, a risk-averse okro farmer will have to know the risk level associated with the investment before making a decision on the line of action to take.

There is little study done on the performance of okro production at Kpando. It is hoped that, this work will help to bridge the gap in research and also serve as a data source for interested investors and a database for policy formulation and implementation at Kpando, and Ghana as a whole.

1.5 Scope and Limitation of the Study

This current study considered the cost and benefit of fresh and seed okro production for a year. Data for the major season as well as the minor season were used for the 2001 production year.

The geographical area of this study is the Kpando district in the Volta Region of Ghana. The district is one of the administrative districts in the Volta Region. Kpando and Hohoe lie adjacent to each other in the middle of the region. The district, lies within the transitional zone of the country. The transitional zone experiences average annual rainfall of 1200 mm to 1300 mm. Although crops grown in the area includes okro, garden eggs, tomatoes, maize and cowpea in rainy season cultivation, okro production has assumed a greater prominence under the irrigation scheme and has become a major income earner for the farmers in dry season cultivation. Economic activities undertaken in the study area include farming, marketing, and processing. The main food crops grown are cassava, maize and yam. The main items processed are cassava, which is processed into gari. Palm fruit is also processed into palm oil locally called "dzomi". For marketing, the main items traded are yam, dzomi, gari, beans, groundnuts, water yam, tomatoes, pepper, garden eggs and okro.

The quantitative data obtained from farmers were mere approximations often recalled from memory. This is because most of the farmers hardly kept records on the exact quantities of inputs used and output realised. However, the combined use of questionnaire information, personal interviews, and observations where necessary

were made to ensure least distortions in information gathered. Limit of time made it impossible to investigate the enterprise over a longer period of time. Another limiting factor of the study is that, the resources available to each farmer differ both in quantity and quality. The managerial potential and objectives also differed. For fear of being asked to pay taxes, some farmers are reluctant to disclose information on their income, payment of social security and other financial obligations as well as production data.

1.6 Organisation of the Study

The report of the present study is divided into five chapters. Chapter one above is the introductory chapter. It gives the background information, problem statement, objectives and relevance or justification of the research undertaken. Chapter two provides a summary of the pertinent literature as related to the research topic. In Chapter three, the methodology and analytical concepts of the study are outlined. Results of the study and discussion of the results are presented in Chapter four. This is followed by the conclusions and recommendations, which are presented in Chapter five.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature relating to fresh and seed okro production, importance of fresh and seed okro, and performance indicators of an enterprise. It also reviews methods, which have been used by previous researchers to compare the profitability of two or more farm production enterprises.

2.2 Fresh and Seed Okro Production

Major areas of okro cultivation include the Northern Savanna Zones (Northern, Upper East and Upper West Regions), Transitional and Coastal Savanna Zones (Brong Ahafo, Greater Accra, and Volta Regions). A thorough land preparation is necessary for okro establishment. It grows best in a sandy loam soil into which well-rotted compost has been incorporated. Early ploughing followed by harrowing twice at two weeks interval is ideal for uniform land preparation. This allows for uniform germination and subsequent destruction of weed seeds before planting (Irvine, 1969; Rice, Rice and Tindall 1986; Sinnadurai, 1992). Armah-Agyemang (1990) reported that, the ideal time to plant okro in the tropics is after March during the rainy season. Dry season planting is done between November and December. Under irrigation, planting is done at any time of the year. Propagation of okro is by seed. Seeds are soaked in water for twenty-four hours prior to sowing to increase the rate of germination and germination percentage (Adjei-Twum, 1962).

Physiological maturity in okro is about 14 days after which ripening of the fruit begins. Seed development in okro reduces the growth and yield of the plant. (Ewete, Taylor and Cheda 1980). There is sequential ripening of okro fruits on the plant in most of the cultivars. Further ripening after maturity consists mainly of desiccation with little transfer of nutrient into the seed. Maturity of the fruit is associated with the fruit becoming grey or brown depending on variety (Kohle and Chavan, 1969; Herklots, 1972; George, 1985; Anoglo, 1990). The matured seed vary in colour from dark green to black.

Okro is picked when it is matured. Fruit and seed maturity in okro differs among the varieties. Fruits are picked when they are still young and tender, and eaten as vegetable. Fruit readily snaps at this stage (Sinnadurai, 1992). It is useless to pick over matured fruits, because consumers reject such fruits. These fruits can be left on the plant for seeds (Purseglove, 1974; Tindall, 1983). Delaying picking until seed is matured and dried might result in yield losses due to lodging and shattering. Seed is extracted when fruit becomes dry and brittle. Seed yield of 1500 kilogrammes per hectare has been reported in the United States of America. The yield of okro seed of different varieties is estimated to range from 900 – 1200 kg/ ha (Herklots, 1972).

Although the seed of okro are comparatively short lived, Martin et al (1981) showed that low temperature (5 ^{o}C) and low moisture content permitted conservation for 11 years. Seeds left in the fruit for storage should be dusted with an insecticide to prevent weevil infestation (Norman, 1992). Seeds begin to deteriorate shortly after they reach physiological maturity in the field (Chauchan and Bhanderi 1971; Ellis and Roberts, 1980). The rate of deterioration is positively related to temperature and moisture content at least to a critical moisture content (Ibrahim and Roberts, 1983).

Deterioration leads to death of the seed. Ellis and Roberts (1982) reported that many sub-cellular changes occur while seed deteriorates and this results in slower germination and poor vigour, which could affect crop yield. Increase in temperature within certain limits will increase the rate of respiration, which produces heat. Okro seed is a bad conductor of heat due to its hard seed coat (Christensen, 1974). If this heat generated is not conducted away, condensation takes place, which can lead to loss in seed viability (Salunkhe, 1986). Kozlowski (1972) reported that seeds showing marked reduction in non-soluble carbohydrate and protein germinate poorly.

The most common and dangerous pest of okro is the flea beetle, *Fruitagrica sjostedti,* followed by aphids, cotton stainers and caterpillars. Aphids and cotton stainers suck sap from shoots causing stunted or abnormal growth. Caterpillars damage flower buds and young fruits, which drop prematurely. Seed bugs, *Oxycarenus* spp, is also a major pest, which feed on developing fruits. Fruit yield and seed viability can be severely reduced as a result of feeding of these seed bugs. Diseases of okro include fusarium wilt, fruit spot, root rot, and stem rot. Others include powdery mildew and cercospora leafspot (Charles and Sherf, 1960; Hill and Waller, 1988).

2.3 Importance of Fresh and Seed Okro

Leaf of okro is used as spinach or fodder for goat. Fresh fruit of okro is used in the preparation of stew and soup in Ghana and throughout West Africa. Fresh fruits contain some amount of protein, carbohydrates, vitamins A and C with traces of B vitamins. It is also a good source of calcium, phosphorus and iron. Roasted and ground seeds are used in cooking and for edible oil extraction (Ramadan, Khalifa and

Aboul-Nasr, 1997). Seeds contain other components in addition to oil, as shown in Table 1.1 below.

Table 1.1 Proximate Composition of Okro Seeds.

Moisture (%)	Protein (%)	Oil (%)	Ash (%)	Crude (%)	Carbohydrate (%)
9.77	23.56	21.29	4.46	16.66	24.26

Source: Berry et al, 1988.

In Ghana, almost every agricultural commodity has become a potential export crop because of the effort to narrow the gap between the traditional export crops like cocoa and coffee, and food crops. Okro is one of the non-traditional export crops being promoted in Ghana to generate more foreign exchange revenue.

2.4 Performance Indicators For Farm Production

Investment appraisal has many dimensions. These are technical, financial, economic and social appraisal. The basic aim of technical appraisal is to find out whether the physical inputs available can be effectively combined to produce the desired outputs in a given environment. Data for technical appraisal is from various technical groups of specialists such as agricultural engineering, soil science and agronomy. The basic aim of financial appraisal is to find out whether the industry or project is financially viable, to ensure the availability of funds necessary for project implementation, and its subsequent operation and maintenance. The appraisal is carried out using discounted and undiscounted methods. Four discounted measures available for use are the net Present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio (B/C), and Net Benefit Investment ratio (N/K). Undiscounted methods, also known as traditional investment appraisal techniques, include Simple Rate of Return and the Payback

Period. Financial ratios that can be used to judge profitability include return on sales, return on equity, and return on assets (Bernard, 1990).

2.4.1 Concept of Farm Budgeting

Farm budgeting is a way to estimate the profitability of a plan, or a proposed change in a plan, before making a decision and implementing it. Examples include enterprise budgeting, partial budgeting and whole farm budgeting. Whole farm budgets are used to derive performance standards. Farm budgeting is a standard farm management technique, which was introduced in the 1960s. Researchers however shifted from whole farm budgeting to enterprise budgeting except in areas where there was intensive intercropping (Carl and Doyce, 1982). Bernard (1990) defined an enterprise as a well-defined production unit, which differs from other production units either by the level of returns to fixed resources or by the end product. The base unit for an enterprise budget is typically one acre for crops and one head for livestock. Using these common units permits an easy and fair comparison across different enterprises. The primary purpose of an enterprise budget is to estimate costs, returns, and profit or net income per acre or per head for the enterprise.

A prominent problem in the use of budgets in analysis is the valuation of inputs and outputs. Small-scale farmers generally purchase few inputs and retain a major portion of farm output for family consumption. The value researchers assign to inputs and outputs become subjective. Another problem is the valuation of family labour in the construction of farm and enterprise budgets. Despite the stress on data and problem of valuation, farm budgeting is a valuable tool of analysis (Ruthenberg, 1980). Budgeting is found to be invaluable in farm survey research because they could be

constructed relatively quickly and the training requirement for building and interpreting budgets are fairly easy relative to programming and regression methods.

2.4.2 Concept of Depreciation

Depreciation is the slowly using up or loss in value of an asset due to age and use of the asset. Depreciation is also defined as the estimated outlay in current prices, which will be required if farmers were to replace the plant and equipment used up during the year (USDA, 1975). Used depreciation is a function of time while time depreciation is the result of obsolescence and occurs regardless of the use of the machine. Obsolescence is the loss in value of the asset as a result of technological improvements resulting in the production of better machines. Fixed costs comprise cost of inputs that do not vary with the level of output or production in the short run that is period of time in which one or more of the inputs do not change. Fixed cost is also known as common cost. Examples of fixed cost items include administrative and office expenses such as accountancy fees, telephone bills and post bills; general overheads such as car expenses, road and other rates, licenses, and general insurance; cost of owning fixed assets like machines and building such as depreciation (Johnson, 1990).

The three main causes of depreciation are wear and tear with use, obsolescence, and gradual deterioration with age. Wear and tear is the loss of value caused by ordinary use as distinct from damage resulting from carelessness or accidents. Ovenden (1961) suggested that under inflationary conditions the calculation of depreciation should be ideally based on current prices of the items. Ways of estimating depreciation of farm assets include the following:

i. Straight-line method or fixed instalment method.

ii. Reducing or diminishing balance method.

iii. Sum of year's digit method.

iv. Annual revaluation method

The straight-line method is the simplest. This method assumes that assets will depreciate evenly throughout its lifespan. It is expressed as:

Depreciation = (Purchase price – salvage value) / lifespan of asset.

2.4.3 Cost of Production and Return on Sale

This is a term used to describe the average cost of producing one unit of a commodity. Cost of production is estimated as:

Cost of production = Total cost / Area under cultivation

Cost of production is a useful concept particularly when marketing the product. Any time the product can be sold for more than its cost of production, a profit is being made.

Return on sales show how large an operating margin the enterprise has on its sales. This is determined by dividing the net income by the revenue. The lower the return on sales, the greater the sales that must be made to make an adequate return on investment. High return on sales of an enterprise indicates larger operating margin of the enterprise per unit of sales, and therefore the more attractive the investment.

2.4.4 Benefit-Cost Ratio

Benefit-cost ratio is a profitability indicator, which expresses the relationship between the sum of net benefits and capital costs over the life of a project. If the ratio is greater than one, it implies that the farmer benefits from the farm enterprise. If the ratio is less than one, it implies that the farmer is not benefiting from the farm enterprise. If the ratio is equal to one, it implies that the farmer is at break-even point, where he neither gains nor loses. Various researchers to determine profitability had used the ratio. Asare (2000) used the ratio in his research work, "Cost-Benefit Analysis of Citrus Production in the Eastern Region of Ghana", and had a benefit-cost ratio of 1.48. This ratio is greater than one and implies that citrus production is profitable. Amoako (1997) and Ofori (1997) also used the ratio in their research work and had a benefit-cost ratio of 1.85 and 1.68 respectively. These ratios are also greater than one and imply that the project is profitable.

2.5 Changes in Key Variables on Crop Profitability

The manager's job is to make decisions in an environment of risk and uncertainty. Risk refers to a situation where the exact outcome is not known, but the probabilities associated with the possible outcomes, estimated objectively with data are known. Uncertainty refers to situations where the probabilities of the outcome are not known but estimated subjectively. Production of agricultural commodities depend to a large extent on some prevailing natural conditions like temperature, rainfall and humidity in a developing country like Ghana. Most Ghanaian okro farmers rely solely on the weather for production. An adverse condition like an outbreak of disease, reduction in the total amount of rainfall will reduce the yield of the crop and consequently reduce gross revenue that will be derived from the production of okro. Farm investment, such

as growing of crops may result in a range of possible yield, net returns, and gross returns. Drought, pest and diseases, price uncertainty and yield influence the outcomes. Any expected increase in income from farming, therefore, entails some risks. Depending on the risk attitude of the individual farmer, a farmer is either risk-averse, risk-neutral, or risk-preferrer. A risk-averse farmer is one who is a caution individual with preference for less risky sources of income. A risk-neutral individual makes his decisions without regard to the risks involved. Risk-preferrers, on the other hand tend to be adventuresome with their liking for risky farm ventures and investment.

There are various methods for assessing risk at the farm level. These include the range, expected value, coefficient of variation, maximin approach and sensitivity analysis.

The range is a measure of variability and is the difference between the highest possible net returns or yields and the lowest possible net returns from the production of okro. A high value implies that the outcome can vary widely. A risk-averse okro farmer may prefer strategies with lower range.

The expected value is found by summing the products of each possible outcome times the probability as follows: $\sum R_i = \sum_i P_i R_i$, where $\sum R_i$ is the expected value, P_i is the probability of each net return and R_i is the net returns. The probabilities associated with each net returns can be established by farmers based on subjective judgement or from historical frequencies over a period of time. Probabilities used in risk analysis must all be non-negative ($P_i \supseteq 0$) and must sum up to one ($\sum_i P_i = 1$). An expected

value of X cedis in terms of net returns, implies that on the average, the net returns of okro production is X cedis per hectare. The risk-averse farmer prefers high expected value in terms of net returns.

The coefficient of variation is the standard deviation divided by the expected value. If the coefficient of variation of a net return of fresh okro production is 0.13 and that of seed okro production is 0.25, then it implies that it is riskier to produce seed okro than fresh okro in terms of net returns variability.

The maximin approach is a method that examines different strategies for only the worst possible outcomes such as the worst profit or net returns in severe drought years. The farm strategy that gives the best result in the worst years is chosen farmer who is assumed to be risk-averse.

Sensitivity analysis is a modelling and risk assessment procedure in which changes are made to significant variables in order to determine the effect of these changes on the planned outcome. This analysis is usually applied to one estimate at a time although it can be applied to each estimate simultaneously.

2.6 Crop Profitability

The determinants of crop profitability are yield of crop, price per unit of output, variable costs, labour and machinery costs. A rewarding way to increase crop profitability is to increase crop yield. The yield of a crop depends on planting of quality seeds, planting of crop at the right time, application of the correct quantities of fertilizer and insecticides, control of weeds on time and the technique employed in

harvesting of the produce among others. High crop yield will increase crop profitability when the price of the product is not reduced significantly (Bernard, 1990).

Introducing a new technique of production, such as introducing irrigation, using a different type of chemical control and using a new seed variety for planting could lead to an increase in crop profitability. The marginal revenue in this case should be high enough to cover the marginal cost. Crop rotation and timeliness of operations are also relevant factors to consider in any intervention to increase crop profitability. Crop rotation is the growing of crop in a sequence on the same piece of land. It maintains soil fertility and increases yield of crops.

Obtaining a higher price for the output and reducing variable cost of production are also vital way for increasing the profitability of crops. Higher price of output could be achieved by improving time of marketing and quality of produce (Bernard, 1990). Opportunities existing for variable cost reduction include, soil analysis in order to avoid wasting fertilizer. Although there is cost associated with soil analysis, the overall effect per hectare is low as compared to the wastage of fertilizer per hectare. Economising in the use of fertilizer by placement rather than broadcasting is also a way to avoid wasting fertilizer in the cultivation of okro in order to reduce variable cost of production. Timely cultivation of the crop to avoid the cost of weedkillers is also necessary to reduce variable cost of production. Timely cultivation will also reduce competition of the crop with weedkillers. Yield of crop is then increased and profitability is increased when the marginal revenue in this case is high enough to cover the marginal cost.

Profitability of a farm enterprise may be raised, by increasing the total gross margin of the farm. Total gross margin of a farm is increased when the gross margins of existing enterprises are increased. It could be also be increased by substituting one or more enterprises for one or more others, or expanding an existing enterprise or reducing a new one without reducing other enterprises. The change will increase crop profitability only if the fixed cost is not raised significantly (Bernard, 1990; Johnson, 1990).

CHAPTER THREE

METHODOLOGY

3.1 Theoretical Framework

Financial analysis is aimed at determining the project's financial profitability on the basis of actual or market prices and is the approach followed in the present study to compare the profitability of fresh and seed okro production. Profitability can be measured in absolute terms or in ratio (Londurback and Dominic, 1982). Net income or profit is an absolute measure of profitability and is given by the difference between gross farm income and total farm expenses (Dillion and Herdaker, 1993). A positive net income of an enterprise implies the production process is profitable and a negative net income implies the production process is not profitable. Ratios measuring profitability include the benefit-cost ratio and return on sales. The benefit-cost ratio is obtained by dividing the present worth of benefit stream by the present worth of cost stream. The selection criteria is to accept all projects with a ratio of one or greater than one, and reject all projects with a ratio less than one. According to Gittinger (1982), return on sales, is one of the important ratios that can be used as a measure of profitability. Return on sales shows the magnitude of the operating margin of an enterprise per unit of sales. High return on sales implies high operating margin, and high profitability of the enterprise. The lower the return on sales the lower the operating margin and the lower the profitability of the enterprise. This ratio is most useful when comparing industries or enterprises in the same sector, and when analysing results of past operations and comparing projection for future expansion.

3.2 Identification of Variables

Input and output variables were carefully identified to measure the performance of each enterprise. Input variables identified include seed for planting, fertilizer, fungicides, insecticides, weedicides, land, labour, and baskets used by the farmer per acre of land. Output variables include total quantity of produce from each enterprise and the price. Total quantity of fresh okro produced is made up of quantities sold, given out as gifts, and that consumed by farmer and family. Total quantity of seed okro produced is made up of quantities sold, given out as gifts, and quantities used as seeds by farmer for planting. Labour activities identified in the production of fresh okro and seed okro include ploughing, harrowing, seeding (seed planting), irrigating, weeding, fungicide application, weedicide application, insecticide application, and shelling of dry fruits.

3.3 Method of Data Analysis

Average cost and average returns per acre of each enterprise were estimated for each farm size from the data collected. These results were then used to estimate total cost and total returns associated with the whole enterprise separately.

In this study, the farm budget procedure was adopted to estimate the profitability of each enterprise separately. The first specific objective, which is to estimate the cost of fresh and seed okro production was achieved by adding total variable cost to the total fixed cost of production in each enterprise separately. Total cost (TC) of production is the sum of total variable cost (TVC) and total fixed cost (TFC).

Variable costs comprise cost of all inputs that vary with the level of output in the short run, and are consumed in the production season. Variable inputs in irrigated agriculture include seeds, fertilizer (N. P. K., sulphate of ammonia, potassium nitrate), cymethoate, karate, Dithane M45, labour, hiring of knapsack sprayer and tractor. Cost of variable inputs, were valued at the prices farmers paid for the adoption of these inputs, that is, at market prices. The actual quantities of inputs used in the production process were used to compute the total cost of the input and not the total quantity of input purchased. The sum of all the costs of these variable inputs gave the total variable cost of production. This was estimated separately for each farmer and enterprise. For a farmer, variable cost of production per unit area was estimated by dividing the variable cost by the area under cultivation.

Fixed costs comprise cost of all inputs that do not vary with the level of output or production in the short run. Fixed inputs identified in the study include land, hoes, irrigation water, baskets, and cutlasses. In the study, irrigation water is treated as a fixed cost item because at Kpando Torkor, farmers are charged a fixed amount for water supplied during the whole production period. Fixed cost was estimated in terms of the value of the fixed input used, during a single production period, that is, the sum of the depreciated value of the input over time. The straight-line method was used to account for the value of fixed assets such as cutlass and hoe. This method spreads the cost of a fixed asset in equal amounts over the economic period of usage. It is expressed as:

$$D = (OC - SV) / N$$

Where,

D = value of depreciation.

OC = original cost of asset.

SV = salvage value

N = expected lifespan of asset.

The salvage value is assumed to be zero since traditional farmers hardly sell or use the farm tool for other economic purposes after its economic life. The expected life of the assets is assumed to be two years for a cutlass or a hoe. The annual depreciation of the assets was evaluated and added to cost of irrigation and land (rent) to get the total fixed cost. For a farmer, fixed cost of production per unit area was estimated by dividing fixed cost by the area under cultivation. Cost of production per hectare was estimated as:

$$CP = \frac{TC}{A}$$

$$CP = \frac{TVC}{A} + \frac{TFC}{A}$$

Where,

CP = Cost of production per hectare.

TC = Total cost

TVC = Total variable cost

TFC = Total fixed cost

A = Area under cultivation in hectares

To estimate the benefits or total revenue (TR) of fresh and seed okro production, the total quantity of produce was multiplied by the unit price. Total quantity of fresh okro produced was estimated from quantities given out as gifts, fresh fruits consumed at home and quantities sold. The sum of these was used as the total quantity of fresh okro produced. Total quantities of fresh okro produced were recorded in baskets (one basket is approximately equal to 20.0 kg). For a farmer, total revenue per unit area was estimated as:

$$TR = \frac{Q * P}{A}$$

Where,

TR = Total revenue per hectare.
Q = Total quantities of fresh okro in baskets.
P = Price of fresh okro in baskets.
A = Area under cultivation in hectares.

Quantity of seed okro produced was estimated from quantities given out as gifts, seeds used for next season planting and quantity sold. The sum of these was used as the total quantity of seed produced. Quantities of seed okro were recorded in bottles (680 ml beer bottle). Unit price of seed okro, and the total quantity of seed okro produced were used to estimate total revenue of seed okro. Fresh and seed okro were valued at farm gate price, because retailers usually visited most farmers on the farm and in houses. Retailers buy the produce and send it to the market for sale.

For a farmer, total revenue per unit area was estimated as:

$$TR = \frac{Q * P}{A}$$

Where,

TR = Total revenue per hectare.
Q = Total quantities of seed okro in bottles.
P = Price of seed okro in bottles.
A = Area under cultivation in hectares.

3.4 Comparing Profitability Estimates

To compare the profitability of fresh and seed okro production, the net income (profit), the benefit-cost concept, and return on sale concept were used.

3.4.1 Net Income

The difference between average revenue and average farm expenses is the average net income of an enterprise. Net income (profit) is given mathematically as:

$$\Pi = [\sum_{i=1}^{N} \frac{TR}{N}] - [\sum_{i=1}^{N} \frac{TFC}{N}] + [\sum_{i=1}^{N} \frac{TVC}{N}]$$

Where,

Π = Net income per enterprise

TR = Total revenue per farmer

TFC = Total fixed cost per farmer

TVC = Total variable cost per farmer

N = number of farmers (1, 2, 3, … N farmers)

A given enterprise is accepted if the profit figure estimated is positive; this indicates profit. The enterprise is rejected if the profit figure estimated is negative, and this indicates a loss. The higher the profit of an enterprise, the better the enterprise.

3.4.2 Benefit-Cost Ratio

Benefit-cost ratio was calculated for each enterprise, that is, fresh okro production and seed okro production. Benefit-cost ratio is a discounted measure of investment or project worth. The ratio was estimated as:

$$B/C = \frac{\sum_{t=1}^{n} B_t / (1+r)^t}{\sum_{t=1}^{n} C_t / (1+r)^t}$$

Where,

B/C = Benefit-Cost ratio

B_t = average total benefit

C_t = average total cost

r = opportunity cost of capital

t = time in years (1, 2 … n)

n = fourth and final year of project

If the ratio is greater than one, it means the farmer benefits from the farm enterprise. If the ratio is less than one, then the farmer is not benefiting from the enterprise. If the ratio is equal to one, it means the farmer is at break-even point, where he neither gains nor loses.

3.4.3 Return on Sale

Comparison of profitability of the two enterprises was also addressed by using return on sales. Return on sale (ROS) is given as:

$ROS = \Pi / ATR$

Π = Net income per hectare of an enterprise

ATR = Average total revenue per hectare of an enterprise

Return on sales shows how large an operating margin, the enterprise has on sales. An enterprise having a low return on sales implies that, greater quantity of the commodity or produce from the enterprise must be sold to make an adequate return on investment. High return on sales of an enterprise indicates larger operating margin of the enterprise per unit of sales, and therefore the more attractive the investment.

3.5 Sensitivity Analysis

Sensitivity analysis takes care of risks and uncertainties about the conclusions drawn on the acceptability of okro enterprise under unfavourable conditions. Cost projections are inevitably subject to high degree of uncertainty about what will actually happen. Unfavourable climatic conditions, pests and diseases can result in low yield of okro. Low yield and low price of okro fruits can result in low benefit in okro production. Okro farmers may borrow from the bank to invest in okro production. A substantial increase in interest rate can erode earnings from the enterprise. A reworking of the analysis was carried out to see what happens when interest rate, revenue, and cost changes for fresh and seed okro. The sensitivity

analysis was therefore undertaken to determine the effect of the following on the profitability of both fresh and seed okro enterprises:

1. A 10% reduction in total revenue in both fresh and seed okro production.

2. A 10% increase in total cost in both fresh and seed okro production.

3. A 50% increase in interest rate.

3.6 Statistical Test

The mean was used as a measure of central tendency. In this study, measures of dispersion used include variance, standard deviation, and coefficient of variation. Coefficient of variation is used to measure the relative variability of the data set. The measures of central tendency and dispersion were used together because the picture of variability of a data set is given by the two measures more than the use of the central tendency alone. The mean values of average cost, total revenue, and net revenue of fresh and seed okro production were compared using the t-distribution to test for difference between means.

3.6.1 Measures of Variability

The coefficient of variation was used to assess variability of the data sets of seed and fresh okro production. It was computed separately for the components of fixed and variable cost for each of the enterprises. Coefficient of variation (CV) is estimated as:

$$CV = SD/X$$

Where,

SD = Sample standard deviation.

X = Sample mean.

A higher value of coefficient of variation implies that there is a higher relative variability, and a lower value of coefficient of variation implies that there is a lower relative variability.

3.6.2 Test of Hypothesis

The following null hypotheses (H_0) were tested against their corresponding alternate hypotheses (H_1):

i. H_0 : The mean total costs of fresh and seed okro production are not different.

H_1 : The mean total costs of fresh and seed okro production are different.

ii. H_0 : The mean total revenue of fresh and seed okro are not different.

H_1 : The mean total revenue of fresh and seed okro are different.

iii H_0 : The mean net revenue of fresh okro production is equal to that of seed okro production.

H_1 : The mean net revenue of fresh okro production is less than that of seed okro production.

A simple t-test was used to test for the differences in mean value of average total cost, average total revenue, and net revenue for fresh and seed okro production. The value of the test statistic for $X_1 - X_2$ was computed as:

$$t_{computed} = \frac{[(x_1 - x_2) - (u_1 - u_2)]}{Sp\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$S_p = \sqrt{\frac{(n_1 - 1)s_1^{\,2} + (n_2 - 1)s_2^{\,2}}{n_1 + n_2 - 2}}$$

Where,

n_1 and n_2 = Sample size of fresh and seed okro respectively.

X_1 = Sample means of average total cost or average total revenue or net revenue for fresh okro enterprise.

X_2 = Sample means of average total cost or average total revenue or net revenue for seed okro enterprise.

S_1 = Sample standard deviation of average total cost or average total revenue or net revenue for fresh okro enterprise.

S_2 = Sample standard deviation of average total cost or average total revenue for or net revenue seed okro enterprise.

U_1 = Population means of average total cost or average total revenue or net revenue for fresh okro enterprise.

U_2 = Population means of average total cost or average total revenue or net revenue for seed okro enterprise.

The values of $U_1 - U_2$ were substituted from the null hypotheses (H_0).

3.7 Data Sources

The prices and quantities of inputs used were obtained from the farmers. Data to estimate cost and revenue were obtained through the use of structured questionnaires. Where necessary, similar data was obtained from dealers in okro inputs. This was done to check the accuracy of information or data obtained from the farmers. Where large differences existed, the suppliers' figures or data was used for input cost, whiles farmers' figures were used for output.

3.8 The Survey

A structured questionnaire was used for the survey. Disorganization of farmers thought was avoided by carefully arranging the questions. A list was prepared for all fresh okro farmers and seed okro farmers. A farmer was randomly selected from the first four names through balloting. Every third name on the list was subsequently selected and interviewed. A total of 90 farmers, 30 for each enterprise, were selected for interviewing, constituting about 48 percent of the entire population.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter is aimed at presenting and analyzing the results of the study. It begins by discussing plot size and total cost estimates for both fresh and seed okro production in the two seasons, that is, rainy season and dry season production. It includes the analysis of fixed cost and variable cost of both enterprises. It continues by analyzing the total revenue and net revenue estimates derived from the production of fresh and seed okro. Results on profitability estimates are also presented and discussed. The chapter ends by discussing problems facing the production of fresh and seed okro. Fresh okro fruits and seed okro are the major reasons for producing okro by different farmers in the study area in the rainy season, but in the dry season the major reason for producing okro is for the fresh immature fruits. Costs and revenue estimates of fresh immature okro fruits and seed okro production in the same season were therefore compared.

4.2 Plot Size per Farmer by Enterprise

A summary of mean plot size by enterprise is presented in Table 4.0. Among the enterprises, mean plot size for seed okro is the lowest at 0.3 hectares. This is followed by fresh okro production in the rainy season, which registered a mean plot size of 0.5. Fresh okro production in the dry season registered a mean plot size of 0.6. This implies that farmers produce seed okro on a smaller size of plot as compared to fresh okro production. Mean plot sizes for individual fresh okro farmers in the rainy season ranged from 0.3 to 0.6, with a coefficient of variation of 21.81%. Plot sizes for

individual seed okro farmers in the same season ranged from 0.2 to 0.4, with a coefficient of variation of 28.72%. This implies that the data set for seed okro production showed variability more than the data set for fresh okro in the same season. Plot sizes for individual fresh okro farmers in the dry season on the other hand ranged from 0.3 to 0.8, with a coefficient of variation of 27.69%.

Table 4.0
Mean Plot Size by Enterprise

Rainy Season				Dry Season	
Fresh Okro	Plot Size (Ha)	Seed Okro	Plot Size (Ha)	Fresh Okro	Plot Size (Ha)
Mean	0.5	Mean	0.3	Mean	0.6
C Var.	0.2181	C Var.	0.2872	C Var.	0.2769
Min.	0.3	Min.	0.2	Min.	0.3
Max.	0.6	Max.	0.4	Max.	0.8

Source: Appendix 1

4.3 Fixed Cost Estimates of Okro Production

The summary of fixed cost estimates for fresh and seed okro production in the rainy and dry seasons is presented in Table 4.1. The Table showed that total fixed costs for individual fresh okro farmers ranged from ¢0.37 million to ¢0.71 million in the rainy season, with a mean of ¢0.61 million. Total fixed costs for individual seed okro farmers in the same season, on the other hand ranged from ¢0.62 million to ¢0.78 million, with a mean of ¢0.68 million. Further analysis reveals that the total fixed cost represents 11.87 percent of the total cost of producing fresh okro fruit in the rainy season and 12.43 percent for seed okro production. The close relationship of the figures is due to the fact that the tools and equipment used for the production of fresh and seed okro are almost the same in the study area. Therefore any intervention to reduce total fixed cost of producing fresh okro could be applied to seed okro production, in order to increase farmer's net income.

Table 4.1
Fixed Cost Estimates Per Hectare of Fresh and Seed Okro Production

Cost Items	Rainy Season		Dry Season
	Fresh Okro (¢'000,000)	Seed Okro (¢'000,000)	Fresh Okro (¢'000,000)
Rent:			
Mean	0.16	0.16	0.16
Coeff. of Variation	0	0	0
Min.	-	-	-
Max.	-	-	-
Depreciation:			
Mean	0.45	0.53	0.43
Coeff. of Variation	0.1309	0.0962	0.1358
Min.	0.22	0.46	0.36
Max	0.55	0.63	0.65
Irrigation:			
Mean	-	-	0.20 flat
Coeff. of Variation	-	-	0
Min.	-	-	0.20
Max	-	-	0.20
Total:			
Mean	0.61	0.68	0.78
Coeff. of Variation	0.0973	0.0742	0.0741
Min.	0.37	0.62	0.72
Max	0.71	0.78	1.01

Source: Appendices 3, 4, and 5.

The coefficient of variation for fresh okro production is 9.73 percent compared with a coefficient of variation of 7.42 percent for seed okro production. Since the coefficient of variation of total fixed cost for seed okro production has a lower value than the coefficient of variation of total fixed cost for fresh okro production, total fixed cost for seed okro production has a lower relative spread than total fixed cost of fresh okro production.

The study revealed that, dry season okro production is focused on fresh okro fruit production. Total fixed costs of individual fresh okro fruit farmers in the dry season ranged from ¢0.72 million to ¢1.01 million, with a mean of ¢0.78 million, and a coefficient of variation of 7.41 percent. Total fixed cost is about 13.73 percent of the total cost.

4.3 Variable Cost Estimates of Okro Production

Variable costs vary with changes in output, and it is a very important component to consider in making production decisions. A summary of total variable cost estimates for fresh okro fruit and seed okro production are presented in Table 4.2.

Table 4.2
Variable Cost Estimates Per Hectare for Fresh and Seed Okro

Cost Item	Rainy Season		Dry Season
	Fresh Okro (¢'000,000)	Seed Okro (¢'000,000)	Fresh Okro (¢'000,000)
Labour:			
Mean	2.37	3.14	3.27
Coeff. of Variation	0.0460	0.2154	0.1975
Min.	2.26	2.25	2.27
Max	2.64	4.98	6.42
Fertilizer:			
Mean	0.40	0.44	0.45
Coeff. of Variation	0.1599	0.0649	0.1568
Min.	0.24	0.39	0.13
Max	0.51	0.50	0.55
Agro-chemical:			
Mean	0.70	0.72	0.71
Coeff. of Variation	0.0608	0.0319	0.1358
Min.	0.57	0.68	0.25
Max	0.75	0.79	0.78
Planting material:			
Mean	0.35	0.38	0.35
Coeff. of Variation	0.1023	0.0529	0.2019
Min.	0.28	0.29	0.03
Max	0.40	0.41	0.47
Transport:			
Mean	0.11	0.12	0.12
Coeff. of Variation	0.1592	0.1189	0.1689
Min.	0.08	0.09	0.09
Max	0.15	0.14	0.18
Total variable cost:			
Mean	4.53	4.79	4.90
Coeff. of Variation	0.0355	0.1433	0.1389
Min.	4.15	3.74	3.68
Max	4.86	6.62	8.03

Source: Appendices 6, 7, and 8.

The total variable cost per hectare of fresh okro production in the rainy season ranged from ¢4.15 million to ¢4.86 million, with a mean of ¢4.53 million and a coefficient

of variation of 3.55 percent. Unlike fresh fruit production, total variable cost for seed okro production ranged from ¢3.74 million to ¢6.62 million, with a mean of ¢4.79 and a coefficient of variation of 14.33 percent. Variable cost accounts for 88.13 percent of the total cost of fresh okro fruit and 87.57 percent for seed okro production in the rainy season. In general, the variable cost of seed okro production is higher than production of fresh okro. This could be due to imputed labour cost associated with threshing dried fruits and drying of seed okro. Total variable cost for dry season fresh okro production ranged from ¢3.68 million to ¢8.03 million, with a mean of ¢4.89 million and a coefficient of variation of 13.89 percent. Variable cost accounts for 86.27 percent of the total cost. About 66.73 percent of the variable cost is attributed to labour cost. Reduction in labour cost could reduce the variable cost, which will increase net income.

4.4 Total Cost Estimates

Total cost of producing fresh and seed okro is presented in Table 4.3. The total cost of producing fresh okro fruits ranged from ¢4.52 million to 5.48 million, with a mean total cost of 5.14 million, whiles total cost of producing seed okro ranged from ¢4.42 million to ¢7.35 million, with a mean total cost of 5.47 million. The coefficient of variation for fresh okro is 3.80 percent, and that for seed okro is 12.66 percent. This implies that there is higher relative variability in the sample of total cost of producing seed okro than fresh okro. The critical values of t for df = 58 and 0.025 in each tail of the t-distribution are –2.00 and 2.00. The value of the test statistics t for $X_1 - X_2$ is –2.516. Because the value of the test statistic t = -2.516 falls in the rejection region, the null hypothesis is rejected. Consequently it's concluded that the mean total cost of producing fresh and seed okro are different.

Table 4.3
Summary of Total Cost Estimates per Hectare (In Million Cedis)

	Rainy Season		Dry Season
	Fresh Okro	Seed Okro	Fresh Okro
Total Fixed Cost:			
Mean	0.61	0.68	0.78
Coeff. of Variation	0.0973	0.0742	0.0741
Min.	0.37	0.62	0.72
Max	0.71	0.78	1.01
Total Variable Cost:			
Mean	4.53	4.79	4.90
Coeff. of Variation	0.0355	0.1433	0.1389
Min.	4.15	3.74	3.68
Max	4.86	6.62	8.03
Total Cost:			
Mean	5.14	5.47	5.68
Coeff. of Variation	0.0380	0.1266	0.1187
Min.	4.52	4.42	4.49
Max	5.48	7.35	8.80

Source: Appendices 9, 10, and 11.

The higher cost of seed okro production as compared to the fresh okro could be due to labour costs associated with threshing of dried fruits, drying of seeds and purchase of 680 ml beer bottle. These activities are not undertaken in fresh okro production.

4.5 Total Revenue Estimates of Okro Production

Total revenue for fresh okro fruit ranged from ¢5.30 million to ¢8.40 million (see Table 4.4), with a mean of ¢6.67 million and coefficient of variation of 12.70 percent for the sample. Unlike fresh okro, seed okro registered a range of total revenue from ¢6.70 million to ¢9.55 million, with a mean of ¢8.30 million. The coefficient of variation for the sample is 7.25 percent.

The total revenue for seed okro production is about ¢1.63 million higher than that of fresh okro fruits production. This could be due to price variability of fresh and seed

okro over the same period of study. The critical values of t for df = 58 and 0.005 in each tail of the t-distribution are –2.66 and 2.66. The value of the test statistics t for $X_1 - X_2$ is –8.581. Because the value of the test statistic t = -8.581 falls in the rejection region, the null hypothesis is rejected. Consequently it's concluded that the mean total revenue of fresh and seed okro are different.

Table 4.4
Mean Total Revenue per Hectare of Fresh and Seed Okro Production (In Million Cedis)

	Rainy Season		Dry Season
	Fresh Okro	Seed Okro	Fresh Okro
Total Revenue:			
Mean	6.67	8.30	10.41
Coeff. of Variation	0.1270	0.0725	0.1121
Min.	5.30	6.70	8.13
Max	8.40	9.55	11.75
Total Cost:			
Mean	5.14	5.47	5.68
Coeff. of Variation	0.0380	0.1266	0.1187
Min.	4.52	4.42	4.49
Max	5.48	7.35	8.80
Net Revenue:			
Mean	1.53	2.82	4.73
Coeff. of Variation	0.5776	0.3529	0.2949
Min.	2.19	0.73	1.72
Max	3.41	5.05	6.39

Source: Appendices 12, 13, 14, 15, 16 and 17.

There is a higher relative variability in the total revenues of fresh okro as compared to seed okro. Total revenue for dry season fresh okro production ranged from ¢8.13 million to ¢11.75 million, with a mean of ¢10.41 million, and a coefficient of variation of 11.21 percent. The high total revenue derived from dry season fresh okro production could be due to high price of the produce. A basket of fresh okro was sold for ¢60,000.00 in the dry season. This high price could be due to demand exceeding supply of fresh okro in the study area.

4.6 Net Revenue Estimates

Net revenue per hectare of fresh and seed okro production is presented in Table 4.4. The net revenue for fresh okro ranged from ¢2.19 million to ¢3.41 million, with a mean of ¢1.53 million, but net revenue for seed okro ranged from ¢0.73 million to ¢5.05 million, with a mean of ¢2.82 million. The coefficient of variation of fresh okro is higher, 57.76 percent, than seed okro with a coefficient of variation of 35.29 percent. The critical values of t for df = 58 of the t-distribution is -2.392. The value of the test statistics t for $X_1 - X_2$ is –5.304. Because the value of the test statistic t = -5.304 falls in the rejection region, the null hypothesis is rejected. Consequently it's concluded that the mean net revenue of seed okro production is higher than that of fresh okro production. Although total cost for seed okro production was higher than fresh okro, net revenue for seed okro is high. This is due to the high total revenue from the production of seed okro. Net revenue of dry season fresh okro enterprise ranged from ¢1.72 million to ¢6.39 million, with a mean of ¢4.73 million / ha and a coefficient of variation of 29.49 percent. Further analysis revealed that the returns from dry season fresh okro fruits production (¢4.73 million / ha) are higher than that of rainy season fresh okro fruit production, which is ¢1.53 million / ha. Okro farmers in the area could expand their farm for the production of fresh okro in the dry season as an attempt to raise their net income. A leguminous crop such as groundnut or cowpea could be cultivated in the rainy season and fresh okro also cultivated in the dry season in a rotation system on the same piece of land. This system will raise the fertility of the soil and reduce total cost of fertilizer application. Net revenue to the dry season okro farmer could be raised in this system.

4.7 Benefit-Cost Ratio

Benefit-cost ratio was calculated for each enterprise, that is fresh okro fruits production, and seed okro production in the rainy season as well as dry season fresh okro fruit production. The ratio was estimated as:

$$B/C = \frac{\sum_{n=1}^{N} B_t / (1+r)^t}{\sum_{n=1}^{N} C_t / (1+r)^t}$$

Where,

B / C = *benefit-cost ratio.*

B_t = average benefit.

C_t = average cost.

r = discount factor.

t = time in years.

4.7.1 Discounted Cash Flow

The financial cash flow was discounted at the opportunity cost of capital and projected in Table 4.5. The farmers used their own resources as a source of capital invested in the 2001-growing season. The rate of return on equity capital was assumed to be the opportunity cost of investing their money in 91-day Treasury bill. The interest rate on a 91-day Treasury bill for the period was 29.7 percent. The cash flow was therefore discounted at 29.7 percent. The benefit-cost ratio for rainy season fresh okro production is 1.33. 1.33 is greater than one by 0.33. This implies that in real terms, every cedi invested in the production of fresh okro fruits would yield an average return of 0.33 of a cedi in the end. The benefit-cost ratio for rainy season seed okro production is 1.38. 1.38 is greater than one by 0.38. This implies that in real

terms, every cedi invested in the production of seed okro fruits would yield an average return of 0.38 of a cedi in the end. Further analysis revealed that 1.38 is greater than 1.33 by 0.05. This implies that in real terms, every cedi invested in both enterprises (fresh orkro and seed okro enterprises) in the rainy season, seed okro would yield an average return of 0.05 of a cedi higher than what fresh okro would yield at the end. The benefit-cost ratio for dry season fresh okro production is 1.80. 1.80 is greater than one by 0.80. This implies that in real terms, every cedi invested in the production of fresh okro fruits would yield an average return of 0.80 of a cedi in the end. Dry season production of fresh okro is higher (0.47) than rainy season fresh okro fruit production. This implies that a cedi invested in the production of fresh okro in the rainy or dry season, dry season fresh okro fruits production would yield 0.47, higher than rainy season fresh okro fruit production in the end.

Table 4.5
The Financial Cash Flow (¢'000,000)

Season	Enterprise	Year	Benefits	Costs	Discount at factor 29.7%	Present worth benefits	Present worth costs
Rainy season	Fresh okro	2001	6.67	5.00	0.7710	5.142600	3.8550
		2002	6.67	5.00	0.5945	3.965315	2.9725
		2003	6.67	5.00	0.4583	3.056861	2.2915
		2004	6.67	5.00	0.3534	2.357178	1.7670
		Total				14.521920	10.8860
	Seed okro	2001	8.30	6.01	0.7710	6.39930	4.63371
		2002	8.30	6.01	0.5945	4.93435	3.572945
		2003	8.30	6.01	0.4583	3.80389	2.754383
		2004	8.30	6.01	0.3534	2.93322	2.123934
		Total				18.07076	13.08497
Dry season	Fresh okro	2001	10.41	5.77	0.7710	8.026110	4.44867
		2002	10.41	5.77	0.5945	6.188745	3.430265
		2003	10.41	5.77	0.4583	4.770903	2.644391
		2004	10.41	5.77	0.3534	3.678894	2.039118
		Total				22.66465	12.56244

Source: Appendices 17 and18.

Table 4.6
Benefit-Cost Ratio of Fresh and Seed Okro Production

Type of Season	Rainy Season		Dry Season
Type of Enterprise	Fresh Okro Fruit	Seed Okro	Fresh Okro Fruit
Total present worth benefit (B)	14.521920	18.07076	22.66465
Total present worth cost (C)	10.8860	13.08497	12.56244
Benefit-cost Ratio (B / C)	1.33	1.38	1.80

Source: Computed from Table 4.5.

4.8 Return on Sale

Return on sale (*ROS*) for rainy season fresh okro production was estimated as:

$$ROS = \sum_{i=1}^{N} \frac{NR}{N} \Big/ \sum_{i=1}^{N} \frac{TR}{N}$$

Where,

NR = Net revenue per farmer.

TR = Total revenue per farmer.

N = Number of farmers

The summary of return on sale for the enterprises is presented in Table 4.5. Return on sale for fresh okro fruit is 0.23, and that for seed okro is 0.34. High return on sale of an enterprise indicates larger operating margin of the enterprise per unit sales, and therefore the more attractive the investment in such an enterprise. This implies that investment in seed okro production could be more attractive than investment in fresh okro fruits production.

Table 4.7
Summary of Enterprise Return on Sale

Type of Season	Rainy Season		Dry Season
Type of Enterprise	Fresh Okro Fruit	Seed Okro	Fresh Okro Fruit
Net Revenue (NR)	1.53	2.82	4.73
Total Revenue (TR)	6.67	8.30	10.41
Return on Sale (NR / TR)	0.23	0.34	0.45

Source: Table 4.4

Return on sale for dry season fresh okro fruit production is 0.45. This also implies that operating margin of the enterprise per unit sales is high. Investment in this enterprise could be attractive.

4.9 Sensitivity Analysis

Sensitivity analysis takes care of risks and uncertainties about the conclusions drawn on the acceptability of the enterprise. The initial conditions in costs and benefits estimates were used in the projections. Summary of result on sensitivity analysis is presented in Tables 4.7, 4.8, 4.9, and Table 4.10.

Under unfavourable conditions, such as a 10 percent increase in costs, the benefit-cost ratio for fresh okro is 1.21 (see Table 4.11). 1.21 is greater than one (1.00) by 0.21. This implies that a cedi invested in the production of fresh okro in the rainy season will yield 0.21 over costs. The benefit-cost ratio for seed okro at the same 10 percent increase in costs is 1.26. The benefit-cost ratio for fresh okro reduced by 0.12 and that for seed okro reduced by 0.13 as a result of a 10 percent increase in costs. This implies that the production of seed okro is more sensitive to an increase in cost than fresh okro production.

The benefit-cost ratio for fresh okro as a result of a 10 percent reduction in revenue is 1.20, and that for seed okro is 1.24. This indicates the acceptability of both fresh and seed okro production. It implies that a cedi invested in the production of fresh okro will yield 0.20 over costs at the end. On the other hand a cedi invested in the production of seed okro will yield 0.24 over costs at the end. Further analysis revealed that the benefit-cost ratio of a 10 percent increase in costs for fresh okro is 1.21, and that of a 10 percent reduction in benefits is 1.20. Again, the benefit-cost ratio of a 10 percent increase in costs for seed okro is 1.26, and that of a 10 percent reduction in revenue is 1.24. In both cases, the ratio is lower at 10 percent reduction in benefits than at a 10 percent increase in costs. This implies that the production of fresh and seed okro are more sensitive to a reduction in benefits more than an increase in costs.

The benefit-cost ratio of a 50 percent increase in discount factor for fresh okro and seed okro in the rainy season are 1.33 and 1.38 respectively. It is 1.80 for fresh okro in the dry season. This implies that a cedi invested in the production of fresh and seed okro in the rainy season will yield 0.33 and 0.38 respectively, dry season fresh okro production will yield 0.80 at the end. Considering fresh okro production in the dry season, a 10 percent increase in costs, a 10 percent reduction in benefits and a 50 percent increase in discount factor, resulted in a benefit-cost ratio of 1.55, 1.62, and 1.80 respectively. This implies that an increase in costs is more sensitive to the production of fresh okro than a reduction in benefits. The least sensitive factor is an increase in discount factor. Farmers can therefore borrow from the banks to expand their farms. This will in turn increase their profit margin at the end. More attention should be paid to general sanitation and the use of high yielding variety in an attempt to increase the benefits derived from the production of both fresh and seed okro.

Table 4.8
Sensitivity analysis at a 10% Increase in Costs

Season	Enterprise	Year	Benefits	Costs	Discount factor at 29.7%	Present worth benefits	Present worth costs
Rainy season	Fresh okro	2001	6.67	5.50	0.7710	5.14257	4.24050
		2002	6.67	5.50	0.5945	3.96532	3.26975
		2003	6.67	5.50	0.4583	3.05686	2.52065
		2004	6.67	5.50	0.3534	2.35718	1.94370
		Total				14.5219	11.9746
	Seed okro	2001	8.30	6.61	0.7710	6.39930	5.09631
		2002	8.30	6.61	0.5945	4.93435	3.92965
		2003	8.30	6.61	0.4583	3.80389	3.02936
		2004	8.30	6.61	0.3534	2.93322	2.33597
		Total				18.0708	14.3913
Dry season	Fresh okro	2001	10.41	6.73	0.7710	8.02611	5.18883
		2002	10.41	6.73	0.5945	6.18875	4.00099
		2003	10.41	6.73	0.4583	4.77090	3.08436
		2004	10.41	6.73	0.3534	3.67889	2.37838
		Total				22.6647	14.6526

Source: Computed from Table 4.5

Table 4.9
Sensitivity analysis at a 10% Reduction in Benefits

Season	Enterprise	Year	Benefits	Costs	Discount factor at 29.7%	Present worth benefits	Present worth costs
Rainy season	Fresh okro	2001	6.00	5.00	0.7710	4.626	3.8550
		2002	6.00	5.00	0.5945	3.567	2.9725
		2003	6.00	5.00	0.4583	2.7498	2.2915
		2004	6.00	5.00	0.3534	2.1204	1.767
		Total				13.0632	10.886
	Seed okro	2001	7.47	6.01	0.7710	5.75937	4.63371
		2002	7.47	6.01	0.5945	4.44092	3.57295
		2003	7.47	6.01	0.4583	3.4235	2.75438
		2004	7.47	6.01	0.3534	2.6399	2.12393
		Total				16.2637	13.085
Dry season	Fresh okro	2001	9.37	5.77	0.7710	7.22427	4.44867
		2002	9.37	5.77	0.5945	5.57047	3.43027
		2003	9.37	5.77	0.4583	4.29427	2.64439
		2004	9.37	5.77	0.3534	3.31136	2.03912
		Total				20.4004	12.5624

Source: Computed from Table 4.5

Table 4.10
Sensitivity analysis at a 50% Increase in Discount Factor

Season	Enterprise	Year	Benefits	Costs	Discount factor at 44.55%	Present worth benefits	Present worth costs
Rainy season	Fresh okro	2001	6.67	5.00	0.6918	4.614306	3.4590
		2002	6.67	5.00	0.4786	3.192262	2.3930
		2003	6.67	5.00	0.3311	2.208437	1.6555
		2004	6.67	5.00	0.229	1.52743	1.1450
		Total				11.54244	8.6525
	Seed okro	2001	8.30	6.01	0.6918	5.74194	4.157718
		2002	8.30	6.01	0.4786	3.97238	2.876386
		2003	8.30	6.01	0.3311	2.74813	1.989911
		2004	8.30	6.01	0.229	1.9007	1.37629
		Total				14.36315	10.40031
Dry season	Fresh okro	2001	10.41	5.77	0.6918	7.201638	3.991686
		2002	10.41	5.77	0.4786	4.982226	2.761522
		2003	10.41	5.77	0.3311	3.446751	1.910447
		2004	10.41	5.77	0.229	2.38389	1.32133
		Total				18.01451	9.984985

Source: Computed from Table 4.5

Table 4.11
Sensitivity analysis at a 10% Increase in Costs, 10% Reduction in Benefits, and 50% Increase in Discount Factor Simultaneously

Season	Enterprise	Year	Benefits	Costs	Discount factor at 44.55%	Present worth benefits	Present worth costs
Rainy season	Fresh okro	2001	6.00	5.50	0.6918	4.1508	3.8049
		2002	6.00	5.50	0.4786	2.8716	2.6323
		2003	6.00	5.50	0.3311	1.9866	1.82105
		2004	6.00	5.50	0.2290	1.374	1.2595
		Total				10.383	9.51775
	Seed okro	2001	7.47	6.61	0.6918	5.167746	4.572798
		2002	7.47	6.61	0.4786	3.575142	3.163546
		2003	7.47	6.61	0.3311	2.473317	2.188571
		2004	7.47	6.61	0.2290	1.71063	1.51369
		Total				12.92684	11.43861
Dry season	Fresh okro	2001	9.37	6.73	0.6918	6.482166	4.655814
		2002	9.37	6.73	0.4786	4.484482	3.220978
		2003	9.37	6.73	0.3311	3.102407	2.228303
		2004	9.37	6.73	0.2290	2.14573	1.54117
		Total				16.21479	11.64627

Source: Computed from Table 4.5

Table 4.12
Enterprise Benefit-Cost Ratios

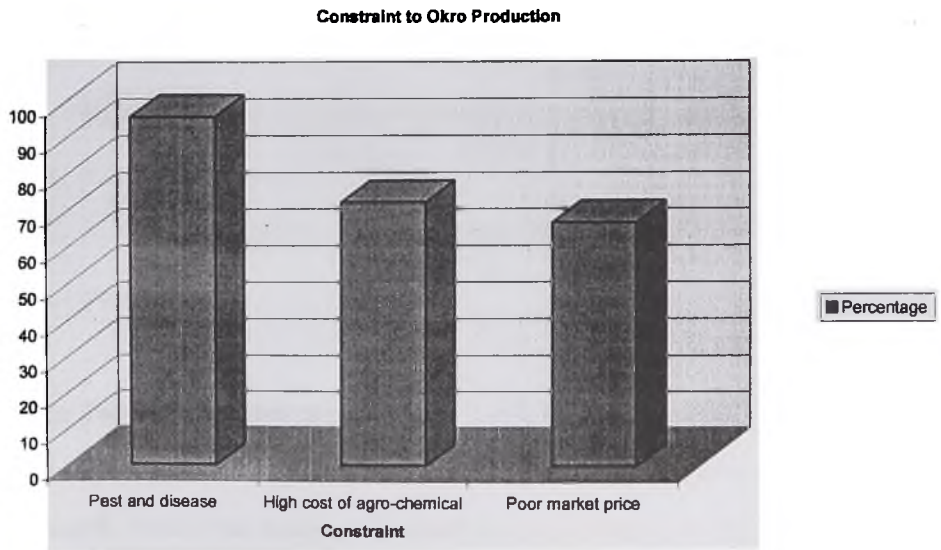
Type of Season	Rainy Season						Dry Season		
Type of Enterprise	Fresh Okro Fruit			Seed Okro			Fresh Okro Fruit		
Sensitivity Factor	10% incr. in costs	10% red. in ben.	50% incr. in DF	10% incr. in costs	10% red. in ben.	50% incr. in DF	10% incr. in costs	10% red. in ben.	50% incr. in DF
Total present worth benefit (B)	14.52	13.06	11.54	18.07	16.26	14.36	22.67	20.40	18.02
Total present worth cost (C)	11.98	10.89	8.65	14.39	13.09	10.40	14.65	12.56	9.99
Benefit-cost Ratio (B / C)	1.21	1.20	1.33	1.26	1.24	1.38	1.55	1.62	1.80

Source: Computed from Tables 4.7, 4.8, and 4.9

4.10 Constraints to Okro Production.

Figure 4.1 shows constraints faced by okro farmers interviewed in the study area. Pest and disease problems, high cost of agro-chemical, and poor market price are the problems facing the production of okro in the study area.

Fig. 4.1



4.10.1 Disease and Pest Problem

Most farmers interviewed mentioned the nematode problem as the main constraint to production. Nematodes are tiny soil borne worms, which attack and nibble at the roots of the plant, sucking out nutrients from the roots and thereby causing root malfunction through rot. The effect becomes severe only when there is a prolonged drought. The main symptom observed is wilting and finally dying of crops. Farmers, sometimes wrongly attribute this dying of crops to water shortages. The most problematic nematode in okro is root knot nematode, *Meloidogyne* spp. The general effect is that the life span of the crop is reduced especially whenever water supply is limited. Ladybird beetle was found to be a major insect pest in the study area. Okro is attacked by a myriad of pests, such as *Podagrica uniformis, Spodoptera littoralis, and Sylepta doogata.*

Although there are various ways of controlling the pest and disease problems, most farmers interviewed adopted the use of insecticide to control pest on their farms. Other effective ways of controlling pest and disease problem are by providing unattractive environment for both the larvae and the adult. This could be achieved by making sure that their alternative host plants such as weeds of the malvaceae and cotton plants do not grow nearby, by clean weeding, and general removal of breeding sites, such as old stubbles.

4.10.2 High Cost of Agro-chemicals

Many okro farmers interviewed reported that agro-chemicals are expensive and not readily available. None of the farmers interviewed used weedicides to control weeds. Weeds were controlled by the use of cutlass or hoe. Agro-chemicals, such as

insecticides and fungicides were used to control pest and diseases on the farm. Although, planting trap crops such as *Crotalaria* spp and African marigold after the growing season can prevent nematode infestations, none of the farmers interviewed used this method to reduce the incidence of nematode infestation on their farms.

4.10.3 Poor market price of produce

Farmers in the study area reported that poor or low market price of okro affected their net income. Obtaining higher price for okro can increase the net income in okro production. A high price is obtained when the bargaining power of the farmers is good. This could be achieved by group action of all okro farmers in the area. Price of okro fruits determined in this way is higher than when individual farmers determine price. Many agricultural markets such as marketing of okro resemble competitive market model. Competitive market assumes that there are so many producers and buyers of a commodity such that interaction of the sellers and buyers in the market produce one price which an individual seller or buyer cannot change alone. Contract agreement with an agency or individual to sell okro can also help the farmer to reduce price risk.

4.11 Suggested Strategies for Solving the Problems

The farmers made both collective and individual effort to solve the above-mentioned problems encountered on their farms. Almost all the farmers, 95.71% used Furadan, a nematicide, to control nematode but were not very successful. As an attempt to minimize nematode infestation, farmers in the study area followed a fallow programme. Only about 37% of the farmers fallowed their plots. According to these farmers, they had this knowledge from the extension agents in the area. The result

possibly implies that about 63% of the farmers do not consciously know that the fallow period is meant to reduce nematode infestation. 3.3% of the farmers suggested the use of neem extract for the control of pest and diseases on the farm. This also suggest that about 96.7% of the farmers do not know about the efficacy and use of neem extract to control pest and diseases on crops. Farmers suggested assistance from government and non-governmental organizations for the export of fresh okro. This according to them could increase net income. Studying of price and market trends may help to stabilize net income by taking advantage of higher prices of okro fruits and lower prices of farm inputs for okro production. Information may be obtained from the District Agricultural Extension Office, District Agricultural Economics Office, by regular visits to traditional markets and other okro farmers in other district or region. Another way to obtain high price is to improve on the quality of okro produced in the area. It should be noted that although extra cost is incurred, the extra returns makes the extra cost worthwhile.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The study revealed that total cost associated with the production of fresh okro is lower (¢5.14 million / ha) than that (¢5.47 million / ha) associated with the production of seed okro in the rainy season. Total revenue was also found to be lower (¢6.67 million / ha) in fresh okro fruit production than in seed okro production, which is about ¢8.30 million / ha. Net income for seed okro production was found to be higher (¢2.82 million / ha) than that for fresh okro production, which is ¢1.53 million / ha. This implies that the higher cost incurred in the production of seed okro is adequately rewarded with higher returns. Therefore, despite the higher cost associated with the production of seed okro it is still more profitable to invest in it than the relatively low cost of producing fresh okro in the rainy season.

The study also revealed that a major reason for producing okro in the dry season is for the fresh and not for seed in the study area. This could be due to demand exceeding supply of fresh okro in the dry season. Total cost, revenue, and net income for this enterprise are ¢5.68 million / ha, ¢10.41 million / ha, and ¢4.73 million / ha respectively.

Sensitivity analysis carried out to take care of risks and uncertainties revealed that the production of fresh and seed okro are all profitable under unfavourable conditions such as a 10 percent increase in costs, a 10 percent reduction in benefits, and a 50 percent

increase in discount factor. Further analysis revealed that reduction in benefits is more sensitive than an increase in costs. The least sensitive factor is an increase in interest rate.

5.2 Conclusion

On the basis of the foregoing results, it can be stated that both fresh and seed okro production in the rainy and dry seasons are profitable. It can also be stated that dry season production of fresh okro is more profitable than production in the rainy season. Again, seed okro production is more profitable than the production of fresh okro in the same rainy season. Okro farmers could therefore strategically invest more in seed okro production in the rainy season and fresh okro production in the dry season to increase their net income. The success of this investment could be attributed to pricing of the products, which is affected by demand and supply of the products. Demand for fresh okro in the dry season far exceeds supply of the product. Lack of well co-ordinated and well-defined marketing rules and practices by majority of the farmers could be a reason attributed to the inability of most farmers to make high profits. The study also revealed that 80% of the people actively involved in okro production are not trained farmers. Knowledge about okro production was gained through practice and experience. Considering their backgrounds, any bad practices are passed on from farm hand to farmhand, without any question.

5.3 Recommendations

In the light of the above findings of the present study the following recommendations are made:

1. Nematode infestation is a problem in the study area, and it is recommended that;

- There should be intensification of extension education on planting of trap crops such as *Crotalaria* sp and African marigold after the growing season to reduce the incidence of nematode infestation.
- As a form of incentives to okro farmers, the government through the Ministry of Food and Agriculture, and the Universities should organize seminars and short courses on eradication of nematode infestation and other pest and diseases problems. This will in the long run improve the skills of okro farmers.
- There should be intensification of extension education on land fallowing. Fallowing is one of the methods used to reduce the incidence of nematode and also to improve soil fertility.

- The problem of high cost of agro-chemicals could be reduced by education on the use of neem extract to control pest. Neem tree was found to be abundant in the area. This implies that access to the leaf or seed, which is mainly used for the preparation of the extract, is not a problem.
- Poor market price of the products, which is one of the major factors leading to low net revenue could be overcome by studying price trends in the district and region to take advantage of high price of okro fruits. The introduction of exotic varieties for trials and a possible way of exporting the crop should therefore be considered in the study area.

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Appendix 1

Sample Questionnaire

A. Socioeconomic characteristics of farmers.

1. Name of farmer.....

2. Age. [] Below 18. []18 – 35. []36 – 60. []Above 60.

3. Sex. [] Male. [] Female.

4. Village.....

5. District.....

6. Marital status. [] Single. [] Married. [] Divorced.

7. Extent of formal education. [] No education. []Primary education. [] Middle/JSS. []SSS/SS. []Tertiary.

8. Occupation. A. Major..... b. Minor.....

9. Number of children.....

B. Input data.

10. Complete the table below on the annual cost at the farm level for okro production.

Input	Major (wet) season		Minor (dry) season	
	Quantity	Unit price	Quantity	Unit price
Seed				
Fertilizer				
Insecticide				
Weedicides				
Fungicides				

11. How much was paid as irrigation charges during
a. Maior season..... b. Minor season.....

12. Fill the table below with the required information.

Tools	Quantity	Unit price	Total
Cutlass			
Hoe			
Basket			
Knapsack sprayer			
Beer bottle 630 ml			
Other			

13. Complete the table below on activities performed on the okro farm by different family and hired labour.

Activities	Major season					Minor season				
	Family labour		Hired labour			Family labour		Hired labour		
	Month	No. of members	No. of workers hired	No. of days wkd	Hrs. wkd /day	Month	No. of members	No. of workers hired	No. of days wkd	Hrs. wkd /day
Ploughing										
Harrowing										
Planting										
Weedicide appl.										
Hand-weeding										
Fertilizer appl.										
Insecticide appl.										
Fungicide appl.										
Harvesting fresh okro										
Harvesting dried okro										
Shelling										
Irrigation										

14. What is the size of your farm under okro cultivation? .....

15.i. Do you pay rent on the farm you are cultivating okro on? []Yes. []No.
ii. If yes, how much rent do you pay annually.....
iii. If no, why (tick one of the options below).
1.[]owner occupier 2.[]family land 3.[]other specify.....

16. i. How much did you spend on transport of inputs to your farm this season? .....
ii. How much did you spend on your own transportation to your farm this season? ...

C. Output data.

17. **a. Fresh okro production.**

Provide information on quantity of produce sold, given out as gifts, and for home consumption in the table below for the 2001 production year.

Quantity of produce per acre							
Major season				Minor season			
Market sales	Given out as gift	Family consumption	Used as seed	Market sales	Given out as gift	Family consumption	Used as seed

b. Seed okro production.

Provide information on quantity of produce sold, given out as gifts, and for home consumption in the table below for the 2001 production year.

Quantity of produce per acre					
Major season			**Minor season**		
Market sales	Given out as gift	Used as seed	Market sales	Given out as gift	Used as seed

D. Marketing of fresh okro:

18 a. Where do you sell your okro? []Farm gate. []Local Torkor market. []Kpando market.

b. What is the distance between production and sale point?

19. What is the method of transporting your produce to the market? []Hired truck. []Own vehicle. []Not transported []Others specify.....

20. How much does it cost you to get to the sale point?.....

E. Marketing of seed okro:

21. Where do you sell your okro? []Farm gate. []Local Torkor market. []Outside Torkor.

22. What is the distance between production and sale point?.....

23. What is the method of transporting your produce to the market? []Hired truck. []Own vehicle. []Not transported []Others specify.....

24. How much does it cost you to get to the sale point?.....

F. Problems

25. What four major problems do you have with okro production? .....

26. How can the problems listed above be solved? .....

G. Sources of Finance

27. What are your sources of finance? []Equity []Bank loan []Money lender []Other (specify)

28. Are you able to pay the loan with interest? []Yes []No

29. If No, state reason(s). .....

Appendix 1

PLOT SIZE PER FARMER BY ENTERPRISE

Rainy Season				Dry Season	
Fresh Okro		Seed Okro		Fresh Okro	
Respondent	Plot Size (Ha)	Respondent	Plot Size (Ha)	Respondent	Plot Size (Ha)
001	0.4	031	0.4	061	0.8
002	0.4	032	0.2	062	0.4
003	0.3	033	0.3	063	0.7
004	0.5	034	0.4	064	0.7
005	0.4	035	0.2	065	0.8
006	0.6	036	0.3	066	0.3
007	0.5	037	0.3	067	0.6
008	0.6	038	0.3	068	0.7
009	0.5	039	0.2	069	0.7
010	0.5	040	0.3	070	0.6
011	0.3	041	0.2	071	0.6
012	0.6	042	0.2	072	0.7
013	0.5	043	0.3	073	0.6
014	0.3	044	0.2	074	0.4
015	0.3	045	0.2	075	0.4
016	0.5	046	0.3	076	0.6
017	0.4	047	0.4	077	0.4
018	0.5	048	0.2	078	0.4
019	0.6	049	0.2	079	0.5
020	0.4	050	0.3	080	0.7
021	0.4	051	0.4	081	0.8
022	0.5	052	0.2	082	0.4
023	0.5	053	0.4	083	0.4
024	0.3	054	0.3	084	0.6
025	0.5	055	0.2	085	0.8
026	0.4	056	0.2	086	0.7
027	0.5	057	0.2	087	0.3
028	0.6	058	0.2	088	0.4
029	0.6	059	0.3	089	0.7
030	0.4	060	0.4	090	0.7
Total	13.8	Total	8.2	Total	17.4
Mean (X)	0.46	Mean	0.27	Mean	0.58
Std. Dev.	0.1003	Std. Dev.	0.0785	Std. Dev.	0.1606
C Var.	0.2181	C Var.	0.2872	C Var.	0.2769
Min.	0.3	Min.	0.2	Min.	0.3
Max.	0.6	Max.	0.4	Max.	0.8

Source: Computed From Field Data

Appendix 2

FIXED COST ESTIMATES PER HECTARE FOR FRESH OKRO FARMERS IN THE RAINY SEASON (IN MILLION CEDIS)

Respondent	Rent	Depreciation	Total Fixed Cost
001	0.16	0.45	0.61
002	0.16	0.43	0.59
003	0.16	0.38	0.53
004	0.16	0.46	0.62
005	0.16	0.48	0.60
006	0.16	0.44	0.59
007	0.16	0.49	0.64
008	0.16	0.55	0.71
009	0.16	0.46	0.61
010	0.16	0.53	0.68
011	0.16	0.45	0.60
012	0.16	0.48	0.63
013	0.16	0.46	0.61
014	0.16	0.53	0.68
015	0.16	0.47	0.63
016	0.16	0.46	0.60
017	0.16	0.45	0.61
018	0.16	0.48	0.64
019	0.16	0.48	0.63
020	0.16	0.38	0.53
021	0.16	0.47	0.63
022	0.16	0.53	0.68
023	0.16	0.47	0.63
024	0.16	0.43	0.58
025	0.16	0.43	0.58
026	0.16	0.46	0.62
027	0.16	0.43	0.58
028	0.16	0.48	0.63
029	0.16	0.45	0.61
030	0.16	0.22	0.37
Total	4.80	13.58	18.30
Mean (X)	0.16	0.45	0.61
Std. Dev. (SD)	0	0.06	0.06
C Var. (SD / X)	0	0.1309	0.0973
Min.	0.16	0.22	0.37
Max.	0.16	0.55	0.71

Source: Computed from Field Data

Appendix 3

FIXED COST ESTIMATES PER HECTARE FOR INDIVIDUAL SEED OKRO FARMERS IN THE RAINY SEASON (IN MILLION CEDIS)

Respondent	Rent	Depreciation	Total Fixed Cost
031	0.16	0.46	0.62
032	0.16	0.50	0.65
033	0.16	0.60	0.76
034	0.16	0.50	0.66
035	0.16	0.53	0.69
036	0.16	0.61	0.77
037	0.16	0.47	0.63
038	0.16	0.61	0.77
039	0.16	0.62	0.77
040	0.16	0.54	0.69
041	0.16	0.63	0.78
042	0.16	0.46	0.61
043	0.16	0.60	0.76
044	0.16	0.50	0.65
045	0.16	0.50	0.65
046	0.16	0.58	0.74
047	0.16	0.50	0.65
048	0.16	0.56	0.72
049	0.16	0.47	0.63
050	0.16	0.49	0.64
051	0.16	0.53	0.68
052	0.16	0.50	0.65
053	0.16	0.50	0.65
054	0.16	0.54	0.69
055	0.16	0.49	0.64
056	0.16	0.51	0.67
057	0.16	0.51	0.66
058	0.16	0.50	0.65
059	0.16	0.52	0.68
060	0.16	0.57	0.73
Total	4.80	15.84	20.53
Mean (X)	0.16	0.53	0.68
Std. Dev. (SD)	0	0.05	0.05
C Var. (SD/X)	0	0.0962	0.0742
Min.	0.16	0.46	0.62
Max.	0.16	0.63	0.78

Source: Computed from Field Data

Appendix 4

FIXED COST ESTIMATES PER HECTARE FOR FRESH OKRO FARMERS IN THE DRY SEASON (IN MILLION CEDIS)

Respondent	Rent	Irrigation Charges	Depreciation	Total Fixed Cost
061	0.16	0.20	0.41	0.76
062	0.16	0.20	0.40	0.76
063	0.16	0.20	0.36	0.72
064	0.16	0.20	0.38	0.74
065	0.16	0.20	0.38	0.74
066	0.16	0.20	0.65	1.01
067	0.16	0.20	0.39	0.75
068	0.16	0.20	0.46	0.80
069	0.16	0.20	0.40	0.75
070	0.16	0.20	0.38	0.73
071	0.16	0.20	0.46	0.80
072	0.16	0.20	0.38	0.73
073	0.16	0.20	0.53	0.88
074	0.16	0.20	0.38	0.73
075	0.16	0.20	0.46	0.80
076	0.16	0.20	0.39	0.75
077	0.16	0.20	0.53	0.88
078	0.16	0.20	0.41	0.76
079	0.16	0.20	0.40	0.76
080	0.16	0.20	0.43	0.78
081	0.16	0.20	0.42	0.78
082	0.16	0.20	0.43	0.78
083	0.16	0.20	0.46	0.82
084	0.16	0.20	0.43	0.78
085	0.16	0.20	0.39	0.74
086	0.16	0.20	0.43	0.78
087	0.16	0.20	0.45	0.81
088	0.16	0.20	0.46	0.80
089	0.16	0.20	0.45	0.80
090	0.16	0.20	0.44	0.79
Total	4.80	6.00	12.83	23.51
Mean (X)	0.16	0.20	0.43	0.78
Std. Dev. (SD)	0	0	0.06	0.06
C Var. (SD / X)	0	0	0.1358	0.0740
Min.	0.16	0.20	0.36	0.72
Max.	0.16	0.20	0.65	1.01

Source: Computed from Field Data

Appendix 5

VARIABLE COST ESTIMATES PER HECTARE FOR FRESH OKRO FARMERS IN THE RAINY SEASON (IN MILLION CEDIS).

Respondent	Labour	Fertilizer	Agro-chemical	Planting Material	Transport	Total Variable Cost
001	2.30	0.43	0.68	0.35	0.11	4.46
002	2.33	0.49	0.70	0.38	0.11	4.60
003	2.50	0.40	0.75	0.35	0.10	4.63
004	2.28	0.50	0.75	0.40	0.08	4.63
005	2.33	0.51	0.68	0.35	0.12	4.57
006	2.50	0.43	0.68	0.30	0.15	4.69
007	2.33	0.40	0.75	0.40	0.11	4.73
008	2.48	0.43	0.70	0.35	0.11	4.67
009	2.33	0.50	0.68	0.30	0.10	4.59
010	2.63	0.43	0.70	0.40	0.08	4.85
011	2.33	0.42	0.68	0.35	0.12	4.48
012	2.28	0.28	0.75	0.34	0.13	4.38
013	2.33	0.43	0.75	0.35	0.10	4.67
014	2.63	0.45	0.68	0.35	0.13	4.87
015	2.33	0.26	0.70	0.30	0.09	4.29
016	2.42	0.36	0.70	0.36	0.11	4.57
017	2.33	0.44	0.57	0.28	0.09	4.35
018	2.28	0.36	0.75	0.30	0.09	4.42
019	2.33	0.42	0.68	0.37	0.08	4.41
020	2.39	0.44	0.70	0.30	0.11	4.54
021	2.30	0.24	0.70	0.38	0.10	4.39
022	2.64	0.36	0.68	0.30	0.09	4.71
023	2.35	0.40	0.63	0.36	0.12	4.42
024	2.28	0.42	0.75	0.30	0.10	4.42
025	2.34	0.39	0.73	0.40	0.09	4.58
026	2.30	0.38	0.73	0.32	0.09	4.40
027	2.33	0.36	0.75	0.39	0.12	4.55
028	2.34	0.38	0.73	0.37	0.09	4.51
029	2.26	0.36	0.68	0.36	0.11	4.15
030	2.27	0.40	0.65	0.36	0.09	4.40
Total	70.99	12.02	20.99	10.40	3.20	135.87
Mean (X)	2.37	0.40	0.70	0.35	0.11	4.53
Std Dev. (SD)	0.11	0.06	0.04	0.04	0.01	0.16
C Var. (SD / X)	0.0460	0.1599	0.0608	0.1023	0.1592	0.0355
Min.	2.26	0.24	0.57	0.28	0.08	4.15
Max.	2.64	0.51	0.75	0.40	0.15	4.86

Source: Computed from Field Data

Appendix 6

VARIABLE COST ESTIMATES PER HECTARE FOR SEED OKRO FARMERS IN THE RAINY SEASON (IN MILLION CEDIS).

Respondent	Labour	Fertilizer	Agro-chemical	Planting Material	Transport	Total Variable Cost
031	2.53	0.42	0.71	0.38	0.11	4.14
032	2.99	0.43	0.73	0.38	0.11	4.63
033	2.78	0.48	0.70	0.36	0.13	4.43
034	2.59	0.43	0.73	0.39	0.10	4.22
035	2.25	0.39	0.70	0.29	0.11	3.74
036	2.46	0.45	0.73	0.40	0.11	4.15
037	3.19	0.43	0.71	0.38	0.10	4.81
038	2.99	0.45	0.72	0.37	0.13	4.66
039	4.20	0.43	0.73	0.39	0.09	5.84
040	3.03	0.41	0.71	0.37	0.12	4.64
041	2.54	0.45	0.79	0.39	0.10	4.26
042	2.59	0.43	0.74	0.38	0.11	4.25
043	3.88	0.46	0.71	0.41	0.11	5.58
044	2.56	0.48	0.71	0.38	0.09	4.21
045	2.78	0.41	0.73	0.37	0.10	4.39
046	2.63	0.45	0.71	0.39	0.10	4.28
047	4.24	0.40	0.72	0.38	0.13	5.87
048	2.54	0.47	0.71	0.37	0.10	4.18
049	3.11	0.45	0.68	0.39	0.10	4.73
050	3.70	0.43	0.79	0.40	0.13	5.46
051	4.13	0.50	0.71	0.37	0.10	5.79
052	2.75	0.50	0.73	0.38	0.09	4.44
053	4.00	0.44	0.72	0.39	0.11	5.66
054	3.03	0.45	0.73	0.40	0.10	4.70
055	3.11	0.40	0.72	0.39	0.11	4.73
056	3.06	0.39	0.76	0.38	0.11	4.69
057	2.55	0.44	0.71	0.38	0.14	4.22
058	3.07	0.45	0.72	0.37	0.10	4.71
059	3.90	0.43	0.72	0.38	0.13	5.56
060	4.98	0.46	0.72	0.36	0.11	6.62
Total	94.09	13.18	21.71	11.35	3.27	143.60
Mean (X)	3.14	0.44	0.72	0.39	0.11	4.79
Std. Dev. (SD)	0.68	0.03	0.02	0.02	0.01	0.7
C Var. (SD / X)	0.2154	0.0649	0.0319	0.0529	0.1189	0.1433
Min.	2.25	0.39	0.68	0.29	0.09	3.74
Max.	4.98	0.50	0.79	0.41	0.14	6.62

Source: Computed from Field Data

Appendix 7

VARIABLE COST ESTIMATES PER HECTARE FOR FRESH OKRO FARMERS IN THE DRY SEASON (IN MILLION CEDIS).

Respondent	Labour	Fertilizer	Agro-chemical	Planting Material	Transport	Total Variable Cost
061	3.38	0.44	0.73	0.35	0.10	4.99
062	3.50	0.43	0.75	0.36	0.10	5.14
063	3.50	0.50	0.73	0.38	0.13	5.23
064	3.30	0.43	0.71	0.32	0.12	4.89
065	3.30	0.51	0.75	0.38	0.12	4.96
066	3.00	0.44	0.71	0.38	0.11	4.64
067	3.12	0.45	0.72	0.35	0.10	4.75
068	2.99	0.44	0.71	0.41	0.16	4.70
069	3.00	0.44	0.72	0.312	0.13	4.62
070	3.24	0.46	0.75	0.33	0.12	4.90
071	3.25	0.50	0.72	0.36	0.10	4.96
072	3.25	0.45	0.71	0.33	0.09	4.83
073	3.15	0.42	0.72	0.34	0.12	4.76
074	3.15	0.45	0.75	0.33	0.10	4.78
075	3.15	0.50	0.71	0.34	0.12	4.82
076	3.47	0.55	0.73	0.38	0.10	5.22
077	3.14	0.50	0.78	0.32	0.10	4.83
078	3.26	0.43	0.71	0.35	0.12	4.85
079	3.00	0.45	0.71	0.33	0.14	4.621
080	3.01	0.46	0.72	0.39	0.12	4.69
081	3.20	0.48	0.73	0.38	0.11	4.87
082	6.42	0.42	0.76	0.38	0.10	8.03
083	2.93	0.44	0.72	0.33	0.11	4.24
084	2.75	0.45	0.72	0.47	0.10	4.50
085	3.28	0.47	0.71	0.35	0.13	4.98
086	3.50	0.50	0.75	0.35	0.13	5.19
087	2.27	0.42	0.71	0.33	0.12	3.68
088	3.00	0.51	0.53	0.39	0.10	4.25
089	3.15	0.13	0.25	0.46	0.11	4.58
090	3.50	0.53	0.75	0.42	0.18	5.41
Total	98.07	13.56	21.30	10.50	3.47	146.89
Mean (X)	3.27	0.45	0.71	0.35	0.12	4.50
Std. Dev. (SD)	0.65	0.07	0.25	0.07	0.02	0.68
C Var. (SD / X)	0.1975	0.1568	0.1358	0.2019	0.1688	0.1389
Min.	2.27	0.13	0.25	0.03	0.09	3.68
Max.	6.42	0.55	0.78	0.47	0.18	8.03

Source: Computed from Field Data

Appendix 8

TOTAL COST ESTIMATES PER HECTARE FOR FRESH OKRO FARMERS IN THE RAINY SEASON (IN MILLION CEDIS).

Respondent	Total Fixed Cost	Total Variable Cost	Total Cost
001	0.61	4.46	5.07
002	0.59	4.60	5.18
003	0.53	4.63	5.16
004	0.62	4.63	5.24
005	0.59	4.57	5.16
006	0.64	4.69	5.33
007	0.71	4.73	5.44
008	0.61	4.67	5.28
009	0.68	4.59	5.27
010	0.60	4.85	5.45
011	0.63	4.48	5.11
012	0.61	4.38	4.99
013	0.68	4.67	5.34
014	0.63	4.87	5.48
015	0.60	4.29	4.89
016	0.61	4.57	5.17
017	0.64	4.35	4.98
018	0.63	4.42	5.05
019	0.53	4.41	4.94
020	0.63	4.54	5.17
021	0.68	4.39	5.07
022	0.63	4.71	5.33
023	0.58	4.42	5.00
024	0.58	4.42	5.00
025	0.62	4.58	5.20
026	0.58	4.40	4.98
027	0.63	4.55	5.18
028	0.61	4.51	5.12
029	0.37	4.15	4.52
030	0.62	4.40	5.02
Total	18.30	135.87	154.14
Mean (X)	0.61	4.53	5.14
Std. Dev. (SD)	0.06	0.16	0.2
C Var. (SD / X)	0.0973	0.0355	0.0380
Min.	0.37	4.15	4.52
Max.	0.71	4.86	5.48

Source: Computed from Field Data

Appendix 9

TOTAL COST ESTIMATES PER HECTARE FOR SEED OKRO FARMERS IN THE RAINY SEASON (IN MILLION CEDIS).

Respondent	Total Fixed Cost	Total Variable Cost	Total Cost
031	0.62	4.14	4.76
032	0.65	4.63	5.28
033	0.76	4.43	5.19
034	0.66	4.22	4.87
035	0.69	3.74	4.42
036	0.77	4.15	4.92
037	0.63	4.81	5.44
038	0.77	4.66	5.42
039	0.77	5.84	6.61
040	0.69	4.64	5.33
041	0.78	4.26	5.04
042	0.61	4.25	4.87
043	0.76	5.58	6.33
044	0.65	4.21	4.86
045	0.65	4.39	5.04
046	0.74	4.28	5.05
047	0.65	5.87	6.52
048	0.72	4.18	4.90
049	0.63	4.73	5.36
050	0.64	5.46	6.10
051	0.68	5.79	6.47
052	0.65	4.44	5.10
053	0.65	5.66	6.31
054	0.69	4.70	5.40
055	0.64	4.73	5037
056	0.67	4.69	5.36
057	0.66	4.22	4.88
058	0.65	4.71	5.37
059	0.68	5.56	6.24
060	0.73	6.62	7.35
Total	20.53	143.60	164.13
Mean (X)	0.68	4.79	5.47
Std. Dev. (SD)	0.05	0.7	0.69
C Var. (SD / X)	0.0742	0.1433	0.1266
Min.	0.62	3.74	4.42
Max.	0.78	6.62	7.35

Source: Computed from Field Data

Appendix 10

TOTAL COST ESTIMATES PER HECTARE FOR FRESH OKRO FARMERS IN THE DRY SEASON (IN MILLION CEDIS).

Respondent	Total Fixed Cost	Total Variable Cost	Total Cost
061	0.76	4.99	5.75
062	0.76	5.14	5.90
063	0.72	5.23	5.95
064	0.74	4.89	5.62
065	0.74	4.96	5.69
066	1.01	4.64	5.64
067	0.75	4.75	5.49
068	0.80	4.70	5.50
069	0.75	4.62	5.37
070	0.73	4.90	5.63
071	0.80	4.96	5.76
072	0.73	4.83	5.56
073	0.88	4.76	5.64
074	0.73	4.78	5.51
075	0.80	4.82	5.62
076	0.75	5.22	5.98
077	0.88	4.83	5.72
078	0.76	4.85	5.61
079	0.76	4.621	5.38
080	0.78	4.69	5.47
081	0.78	4.87	5.65
082	0.78	8.03	8.81
083	0.82	4.24	5.06
084	0.78	4.50	5.28
085	0.74	4.98	5.72
086	0.78	5.19	5.97
087	0.81	3.68	4.49
088	0.80	4.25	5.05
089	0.80	4.58	5.39
090	0.79	5.41	6.20
Total	23.51	146.89	170.41
Mean (X)	0.78	4.50	5.68
Std. Dev. (SD)	0.06	0.68	0.67
C Var. (SD / X)	0.0741	0.1389	0.1187
Min.	0.72	3.68	4.49
Max.	1.01	8.03	8.80

Source: Computed from Field Data

Appendix 11

TOTAL REVENUE ESTIMATES PER HECTARE FOR FRESH OKRO FARMERS IN THE RAINY SEASON

Respondent	Quantity of Fresh Okro Produced (In Baskets)	Price Per Basket (¢'000)	Quantity Used as Seed (In 680 ml bottles)	Price Per Bottle (¢'000)	Total Revenue (¢'000,000)
001	165	35	2.5	20	5.83
002	155	45	3.8	20	7.05
003	137.5	45	3.8	20	6.26
004	165	40	1.3	20	6.63
005	170	35	3.8	20	6.03
006	160	40	3.8	20	6.48
007	170	35	1.3	20	5.98
008	165	35	2.5	20	5.83
009	170	45	3.8	20	7.73
010	150	45	1.9	20	6.79
011	175	40	3.8	20	7.08
012	175	35	3.5	20	6.20
013	142.5	40	2.5	20	5.75
014	125	45	3.8	20	5.70
015	175	45	2.5	20	7.93
016	148	40	1.9	20	5.96
017	185	45	3.5	20	8.40
018	198	30	3.8	20	6.02
019	155	35	1.9	20	5.46
020	180	40	3.8	20	7.28
021	135	45	3.8	20	6.15
022	175	35	2.5	20	6.17
023	170	40	1.9	20	6.84
024	165	45	3.8	20	7.50
025	165	45	1.9	20	7.46
026	175	40	2.5	20	7.05
027	165	45	3	20	7.49
028	194	40	2.5	20	7.81
029	150	35	2.5	20	5.30
030	175	45	4.5	20	7.97
Total	4935	1209.9	88.4	600	200.1
Mean (X)	164.5	40.33	2.94	20	6.67
Std. Dev. (SD)	16.58	4.54	0.90	0	0.85
C Var. (SD / X)	0.1008	0.1125	0.3057	0	0.1270
Min.	125	30	1.3	20	5.30
Max.	198	45	4.5	20	8.40

Source: Computed from Field Data

Appendix 12

TOTAL REVENUE ESTIMATES PER HECTARE FOR SEED OKRO FARMERS IN THE RAINY SEASON

Respondent	Quantity of Fresh Okro Produced (In Baskets)	Price Per Basket (¢'000)	Quantity Used as Seed (In Bottles)	Price Per Bottle	Total Revenue (¢'000,000)
031	50	25	367.5	20	8.60
032	52.5	30	382.5	20	9.23
033	60	25	402.5	20	9.55
034	50	20	352.5	20	8.05
035	52.5	30	395	20	9.48
036	45	35	360	20	8.78
037	40	25	390	20	8.80
038	45	25	352.5	20	8.18
039	37.5	25	340	20	7.74
040	52.5	30	360	20	8.78
041	35	35	340	20	8.03
042	40	25	365	20	8.30
043	45	35	355	20	8.68
044	45	25	345	20	8.03
045	40	20	360	20	8.00
046	50	30	342.5	20	8.35
047	55	25	372.5	20	8.83
048	60	30	320	20	8.20
049	45	25	360	20	8.33
050	40	25	350	20	8.00
051	45	25	360	20	8.33
052	50	30	260	20	6.70
053	40	25	320	20	7.40
054	37.5	30	310	20	7.33
055	32.5	25	385	20	8.51
056	45	25	355	20	8.23
057	30	30	375	20	8.40
058	30	25	350	20	7.75
059	40	20	372.5	20	8.25
060	35	25	360	20	8.08
Total	1325.1	804.9	10659.9	600	249
Mean (X)	44.17	26.83	355.33	20	8.30
Std. Dev. (SD)	8.02	4.04	27.81	0	0.60
C Var. (SD / X)	0.1817	0.1507	0.0783	0	0.0724
Min.	30	20	260	20	6.70
Max.	60	35	402.5	20	9.55

Source: Computed from Field Data

Appendix 13

TOTAL REVENUE ESTIMATES PER HECTARE FOR FRESH OKRO FARMERS IN THE DRY SEASON

Respondent	Quantity of Fresh Okro Produced (In Baskets)	Price Per Basket (¢'000)	Quantity Used as Seed (In Bottles)	Price Per Bottle	Total Revenue (¢'000,000)
061	180	60	1.3	20	10.83
062	180	60	2.5	20	10.85
063	185	60	2.5	20	11.15
064	190	60	1.3	20	11.43
065	180	60	1.9	20	10.84
066	175	60	2.5	20	10.55
067	185	60	2.5	20	11.15
068	190	60	3.8	20	11.48
069	180	60	1.3	20	10.83
070	190	60	2.5	20	11.45
071	195	60	2.5	20	11.75
072	185	60	1.3	20	11.13
073	135	60	1.9	20	8.14
074	180	60	1.9	20	10.84
075	185	60	1.3	20	11.13
076	135	60	3.8	20	8.18
077	185	60	3.8	20	11.17
078	180	60	5.0	20	10.90
079	135	60	1.3	20	8.13
080	180	60	2.5	20	10.85
081	142	60	5.0	20	8.65
082	175	60	1.3	20	10.53
083	180	60	3.8	20	10.88
084	135	60	2.0	20	8.14
085	175	60	2.0	20	10.54
086	150	60	4.0	20	9.08
087	180	60	2.0	20	10.84
088	190	60	2.0	20	11.44
089	180	60	2.5	20	10.85
090	143	60	2.0	20	8.59
Total	5180.1	1800	75	600	3123
Mean (X)	172.67	60	2.5	20	10.41
Std. Dev. (SD)	19.50	0	1.08	0	1.17
C Var. (SD / X)	0.1129	0	0.4377	0	0.1121
Min.	135	60	1.3	20	8.13
Max.	190	60	5.0	20	11.75

Source: Computed from Field Data

Appendix 14

NET REVENUE ESTIMATES PER HECTARE FOR FRESH OKRO FARMERS IN THE RAINY SEASON

Respondent	Total Revenue (¢'000,000)	Total Cost (¢'000,000)	Net Revenue (¢'000,000)
001	5.83	5.07	0.76
002	7.05	5.18	1.87
003	6.26	5.16	1.12
004	6.63	5.24	1.38
005	6.03	5.16	0.87
006	6.48	5.33	1.15
007	5.98	5.44	0.54
008	5.83	5.28	0.54
009	7.73	5.27	2.45
010	6.79	5.45	1.34
011	7.08	5.11	1.96
012	6.20	4.99	1.21
013	5.75	5.34	0.40
014	5.70	5.48	0.22
015	7.93	4.89	3.04
016	5.96	5.17	0.79
017	8.40	4.98	3.41
018	6.02	5.05	0.96
019	5.46	4.94	0.53
020	7.28	5.17	2.11
021	6.15	5.07	1.08
022	6.17	5.33	0.84
023	6.84	5.00	1.84
024	7.50	5.00	2.50
025	7.46	5.20	2.26
026	7.05	4.98	2.07
027	7.49	5.18	2.30
028	7.81	5.12	2.69
029	5.30	4.52	0.78
030	7.97	5.02	2.94
Total	200.1	154.14	45.9
Mean (X)	6.67	5.14	1.53
Std. Dev. (SD)	0.85	0.2	0.88
C Var. (SD / X)	0.1270	0.0380	0.5776
Min.	5.30	4.52	2.19
Max.	8.40	5.48	3.41

Source: Computed from Field Data

Appendix 15

NET REVENUE ESTIMATES PER HECTARE FOR SEED OKRO FARMERS IN THE RAINY SEASON

Respondent	Total Revenue (¢'000,000)	Total Cost (¢'000,000)	Net Revenue (¢'000,000)
031	8.60	4.76	3.84
032	9.23	5.28	3.94
033	9.55	5.19	4.36
034	8.05	4.87	3.18
035	9.48	4.42	5.05
036	8.78	4.92	3.86
037	8.80	5.44	3.36
038	8.18	5.42	2.75
039	7.74	6.61	1.13
040	8.78	5.33	3.44
041	8.03	5.04	2.98
042	8.30	4.87	3.43
043	8.68	6.33	2.34
044	8.03	4.86	3.16
045	8.00	5.04	2.96
046	8.35	5.05	3.33
047	8.83	6.52	2.31
048	8.20	4.90	3.30
049	8.33	5.36	2.96
050	8.00	6.10	1.90
051	8.33	6.47	1.85
052	6.70	5.10	1.60
053	7.40	6.31	1.09
054	7.33	5.40	1.93
055	8.51	5037	3.14
056	8.23	5.36	2.87
057	8.40	4.88	3.52
058	7.75	5.37	2.38
059	8.25	6.24	2.01
060	8.08	7.35	0.73
Total	249	164.13	84.6
Mean (X)	8.30	5.47	2.82
Std. Dev. (SD)	0.60	0.69	1.0
C Var. (SD / X)	0.0724	0.1266	0.3529
Min.	6.70	4.42	0.73
Max.	9.55	7.35	5.05

Source: Computed from Field Data

Appendix 16

NET REVENUE ESTIMATES PER HECTARE FOR FRESH OKRO FARMERS IN THE DRY SEASON

Respondent	Total Revenue (¢'000,000)	Total Cost (¢'000,000)	Net Revenue (¢'000,000)
061	10.83	5.75	5.08
062	10.85	5.90	4.95
063	11.15	5.95	5.20
064	11.43	5.62	5.80
065	10.84	5.69	5.14
066	10.55	5.64	4.91
067	11.15	5.49	5.66
068	11.48	5.50	5.97
069	10.83	5.37	5.46
070	11.45	5.63	5.82
071	11.75	5.76	5.99
072	11.13	5.56	5.57
073	8.14	5.64	2.50
074	10.84	5.51	5.33
075	11.13	5.62	5.51
076	8.18	5.98	2.20
077	11.17	5.72	5.46
078	10.90	5.61	5.29
079	8.13	5.38	2.75
080	10.85	5.47	5.38
081	8.65	5.65	3.05
082	10.53	8.81	1.72
083	10.88	5.06	5.82
084	8.14	5.28	2.86
085	10.54	5.72	4.82
086	9.08	5.97	3.11
087	10.84	4.49	6.35
088	11.44	5.05	6.39
089	10.85	5.39	5.46
090	8.59	6.20	2.39
Total	312.3	170.41	141.9
Mean (X)	10.41	5.68	4.73
Std. Dev. (SD)	1.17	0.67	1.39
C Var. (SD / X)	0.1121	0.1187	0.2949
Min.	8.13	4.49	1.72
Max.	11.75	8.80	6.39

Source: Computed from Field Data

Appendix 17

CAPITAL AND OPERATING COSTS

Item	Rainy Season		Dry Season
	Fresh Okro (¢'000,000)	Seed Okro (¢'000,000)	Fresh Okro (¢'000,000)
Capital Costs:			
Tools & Equipment	0.91	1.06	0.86
Rent	0.16	0.16	0.16
Irrigation Charges	-	-	0.20
Sub-Total	1.07	1.22	1.22
Operating Costs:			
Planting Material	0.35	0.39	0.33
Labour	2.37	3.14	3.27
Fertilizer	0.40	0.44	0.45
Agro-Chemical	0.70	0.72	0.71
Transport	0.11	0.10	0.12
Sub-Total	3.93	4.79	4.88
Total	5.00	6.01	6.00

Source: Computed from Field Data

Appendix 18

FINANCIAL BENEFITS FROM SALES

Item	Rainy Season		Dry Season
	Fresh Okro (¢'000,000)	Seed Okro (¢'000,000)	Fresh Okro (¢'000,000)
Quantity of fresh okro produced (baskets per hectare)	164.50	44.17	172.67
Price per basket	0.04	0.03	0.06
Quantity of seed okro produced (680 ml bottle per hectare)	2.95	355.33	2.47
Price per bottle	0.02	0.02	0.02
Total sales	6.67	8.30	10.41

Source: Computed from Field Data