FARMERS' RESPONSE TO AGRICULTURAL INNOVATIONS
IN NDIVISI LOCATION BUNGOMA DISTRICT: THE CASE
OF LUKUSI AREA

BY

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SUPERVISOR

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A dissertation presented in part fulfillment for the award
of the degree of Bachelor of Arts in Anthropology of the
University of Nairobi. 1990
DECLARATION

This is my original work and has not been presented to any other University for the award of a degree.

MATHEWS GODFREY MUYEKHO

This work has been presented with my approval as a University Supervisor.

DR. J.A.R. WEMBAH - RASHID
TO MY LATE FATHER, FESTUS MUYEKHO
ACKNOWLEDGEMENTS

I sincerely thank all people who contributed to the success of this research. I am deeply indebted to the respondents for their cooperation during the interviews and to the officials of the Lukusi Coffee Farmers' cooperative society for their invaluable information which they made available to me.

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Last but not least, I am grateful and wish to express my appreciation to my 'comrades' from other faculties/departments
of the University of Nairobi for either, their keen interest in my work, or their good company - they constituted "a social recipe" for my existence at the University.

Mathews Godfrey Muyekho

April, 1990
This study has been carried out in a community of small-scale mixed farmers. The concern is to explain the farmers' differential response to the diffusion of coffee into the community given that the area has a high potential for the production of this cash crop. While some farmers have adopted the crop, others have not. It was felt that there was need to identify the positive and negative aspects of the farmers' attitudes toward agricultural innovations such as coffee which is not indigenous to the community under study.

It is hoped that the findings of this study will provide a contribution to theory formation on strategies and tactics of planned organizational change and may serve as useful information in formulating policy programmes for agricultural development. The data that are presented have been derived from the existing literature on the subject, author's personal face-to-face interview of the respondents and participant-observation of the members of the community.

The findings show that factors related to the socio-economic characteristics of farmers (e.g. age and formal education) and situational factors (e.g. availability of credit facilities and labour) are not crucial for farmers' receptivity to coffee. Rather it is the change agents who matter. The major explanatory factor is farmers' awareness of the need for such an innovation. That awareness can, on
the main, be cultivated by appropriate information from the agents of change. In other words there is need for greater agricultural extension services to enhance this awareness in farmers.

The work is presented in six chapters. The first chapter concentrates on some background information, the problem of the study, objectives, and the rationale for the study. The second chapter is devoted to the literature review, theoretical frameworks and the generation of hypotheses. The third chapter is centred on the environmental setting of the study area, Ndivisi Location. The fourth chapter essentially deals with the methodology, while data presentation, analysis and interpretation form the core of the fifth chapter. Finally, conclusions and suggestions are presented in the last chapter.
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CHAPTER 1

1.1 Background Information

Agriculture is a very important human activity. In rural areas, it is the main mode of livelihood, both as a means for subsistence and cash income. In Kenya, the agricultural industry remains one of the major sources of foreign exchange.

In this study, the author investigated ways by which farmers in Ndivisi Location cope with the need to adopt new farming techniques and practices. Recent years have witnessed a significant change in agricultural practices in most parts of Kenya. This change is a response to government policy which urges farmers to improve their agricultural practices and strategies. However, not all areas have responded instantaneously to this call. Some areas lag behind and continue with the traditional practices which they consider or rather feel, best fulfil their needs.

In Ndivisi Location in general, and in Lukusi area in particular, both attributes obtain. Some farmers have incorporated new practices into the traditional ones, some have not. However, most farmers have adopted a number of innovations that pertain to food crop production. A few cash crops have found acceptance but not on a wider scale.
The study looked into innovations related to crop husbandry with special emphasis to the adoption or rejection of coffee growing by farmers. Coffee is not indigenous to African farmers in Kenya. Its introduction dates back to the late nineteenth century when Christian missionaries tried the crop on a small scale in the areas they settled, especially in central Kenya. Its adoption as a cash crop and subsequent developments during the first half of the twentieth century was dominated by European settlers.

In the Western Province of Kenya, coffee growing by African farmers was introduced between 1956 and 1963 following the general mobilisation of the African economy as part of government policy (Ogutu, 1975). Hitherto, the colonial government stressed the aim of African agriculture as merely getting sufficient food to maintain life (Department of Agriculture, 1945). It was believed that Africans in Kenya had not yet reached the level of education to enable them to successfully plan their agricultural economy. However, in 1954, the Swynnerton Plan changed this state of affairs. It recommended the intensification of African agriculture to African farmers to participate in agricultural planning and coordinated development in their communities. Upon this, fragmented plots were consolidated and title deeds issued to ensure security of farmers' tenure of land. Other facilities that were introduced and developed to meet the farmers' needs included the provision of technical assistance, marketing
facilities and accessibility to sources of agricultural credit. To make use of these facilities, insistence was placed upon sound cultural practices and that planting of coffee should only be within appropriate ecological zones of proved suitability. For the control of cash crops, District Cash Crops Boards were to be established to ensure the growing and development of relevant crops in their areas. Cooperative societies were also to be formed thereafter (Swynnerton, 1954: 8-15).

The recommendations of the Swynnerton Plan very much encouraged farmers all over the country to take agriculture seriously. More money flowed into the hands of the African farmer. The establishment of the Agricultural Betterment Fund Scheme assisted the farmers by providing them with bonuses as an incentive to good farming. Higher produce prices for all agricultural commodities helped boost the income for rural communities.

1.2 The Problem

Coffee growing was introduced into Bungoma District spontaneously. Farmers were encouraged, through government policy, to take up the crop. Ndivisi Location has a gently sloping terrain with good fertile deep soil and more than 35 inches of rainfall per annum. With moderate temperatures, intensive agriculture is possible and both arabica and robusta coffee can be grown.
With the foregoing attractive conditions that prevail in Ndivisi Location, one would have expected all farmers in the area to adopt coffee growing. However, this has not been the case. For, from the 1960s when the crop was generally adopted in the location, only a small proportion of farmers cultivate it extensively and actively.

What are the circumstances that have led only a few farmers to adopt and many not to adopt coffee cultivation?

1.3 Objectives of the Study

To identify, investigate and document for analysis:

1. Farmers who cultivate coffee actively and those who do not.
2. Farmers' attitudes towards agricultural innovations generally and those related to coffee in particular.
3. Mechanisms through which farmers have come to adopt the crop.

1.4 Rationale for the Study

1. Although many studies on agricultural innovations and how they can be adopted or otherwise have been conducted in Kenya, no such work was done in Ndivisi Location. This study, it is hoped, is a contribution towards that end. In this exercise another added contribution is in the field of theory formation, in this case that related to strategies and tactics of planned organizational change.
2. At another level the study provides systematic and scholarly information which could be used by government and development agencies in the process of formulating policy and programmes for agricultural development, especially in encouraging the cultivation of coffee in the area of study. This is particularly important considering the place of coffee in Kenya's agricultural economy.
CHAPTER 2

2.1 Literature Review

In Ndivisi Location, a comprehensive study of general agricultural innovations was done by Misiko (1976) as part of a wider study of Bungoma district. Misiko wanted to identify the incentives perceived by farmers which lead them to adopt recommended practices related to hybrid maize production and the disincentives which lead other farmers not to adopt what was recommended. In his study, Misiko used the behavioral differential models after Lippit (1958) and Leagans (1963). He believes that there are many different theories that can be used to explain the behavioral change in farmers. In his model, Lippit postulates three kinds of forces in human behavioral change that may be associated with the adoption of innovations. Firstly, there is force that motivates people to change by creating dissatisfaction with the status quo and favourable judgement of potential future situation. Secondly, there are resistance forces that motivate people not to change. These two kinds of forces result from uncertainty of the unknown and inability to change. Finally, interference forces obstruct change without being directly related to it.

As for Leagans (1963:89) the behavioral differential model assumes that "changes that are important to people are those which help them meet their needs for biological, economic, social, aesthetic or moral well being".
Misiko argues that farmers would not resist adoption of agricultural innovations if the incentives perceived by them were strengthened while the disincentives perceived by them were weakened or removed. He further contends that farmers are aware of the need for improved agricultural production and have a favourable mental set, but do not adopt new recommended innovations largely because of the immediate physical, economic, and biological environmental constraints. He is of the opinion that knowledge about innovations and achievement of the needed skills to use it is not enough. Overt action as well as favourable physical conditions (e.g. ready access to required production inputs) must also be present. In effect, Misiko constructed a conceptual model suggesting the main indicators of socio-economic (e.g. wealth and operational capital), situational (e.g. availability of production inputs), and communicational (e.g. change agents) as primary influencers which relate on the eventual decision making of a farmer. He emphasizes that depending on the needs of the farmer, these factors create the overall conditions constituting incentives and disincentives perceived by farmers to be determinants of adoption or non adoption of agricultural innovations.

From this stand point, he concludes that the greater the amount of contact the farmers had with agricultural extension agents, the more likely they adopted agricultural practices and innovations. Farmers' social participation in formal organizations was negatively related to their adoption
behaviour. He also argues that farmers who are better-off economically in production resources are more receptive to new technologies in agriculture. Misiko does not see the distance of farms from input markets as an element of major importance in explaining the variation in the adoption behaviour. And, the socio-psychological variables i.e. the farmers' ability, self-commitment, expectation, opportunity, goals and support, are seen as functions of the incentives and disincentives in influencing their behaviour.

In this study, the validity of two of his conclusions is questioned. The second conclusion that "farmers' social participation in formal organizations is entatively related to their adoption behaviour", needs further examination. Formal organizations in this context such institutions or establishments as cooperative societies (e.g. the Kenya Grain Growers' Cooperative Union; Coffee Farmers' Cooperative societies); agricultural societies (e.g. the Agricultural Society of Kenya); farmers' training centres and field demonstrations. The impact of these formal organizations to farmers is of the degree comparable to that of the extension service offered by the Ministry of Agriculture. Most, if not all, farmers' cooperative societies give guidance to farmers on ways and means to improve crop production; they also offer credit facilities to bonafide members who happen to have 'shares' in them. A good example are the coffee cooperative societies. Most of them are affiliated to coffee pulping factories. These provide member framers with coffee
seedings which are raised in the nurseries within the factory premises. In addition they provide production inputs such as fertilizers, and pesticides, all these being considered as loans. In return, the factories act as markets in that they receive the harvests. Farmers' social participation in formal organizations is likely to enable them learn new ideas and techniques, which create some influence in their adoption behaviour or increased production.

The idea that the distance between farms and input markets is insignificant in explaining variations in the adoption behaviour, finds no support here. Most farmers in areas of small-scale production are served by input markets located at some far away distances. Market centres or towns may be situated away from the remote rural areas. Since most of these farmers are poor to afford expensive means for ferrying the inputs, they are likely to be affected in their efforts to engage in new farming activities. Added to this is the fact that most of these small-scale farmers compete with the well-to-do farmers. They need easy access to input markets. Where a small-scale farmer fails to get inputs in time he or she will opt to change his or her programme unlike the progressive and economically sound farmer who operates on a timetable and uses every possible means and alternatives to get inputs. The distance between the farms and input markets is an important factor as any other factor that necessitates agricultural production.
Uchendu and Anthony (1975) aimed at assessing the prevailing agricultural situation, particularly the receptivity of the farming community to new techniques among the Gusii of Kisii District, Kenya. They noticed that the so-called 'progressive' farmers were characterized by management ability, access to resources of land, labour and capital; had had formal education coupled with experiences from the outside world progressive farmers are also seen to exhibit outstanding cultured trait which distinguishes them from their neighbours and are quite conducive to change. They are branded as "men of influence" who are very willing to "try something new" and were first adopters of technical innovations.

They also describe Gusii farmers as characterized by young age, most of whom have had off-farm employment experiences. Thus "vicarious experiences acquired by farmers in various farm and non-farm occupations outside the district are a major conditioning factor in Gusii receptivity to technical innovations in agriculture".

On the whole we are told that Gusii response to agricultural innovations represents a model of "cumulative" change rather than instant transformation. This is reflected in the sequence in which innovations have been introduced and adopted, and in the characteristics of individual innovations which tend to make them "self-spreading" e.g. the lower the risk involved in the innovation, the more acceptable it is.
Lastly, it is observed that a more efficient innovation sequence has been followed in the highlands than in the lowlands. This is due to an ecologically high potential in the highlands. As such there is a high concentration of the most viable cash crops, tea and pyrethrum. Another motivating factor in the highlands is the presence of better access roads. Farmers in the highlands are also more responsive to technical change because they have better economic opportunities. However, it was found that an efficient market organization with urban contacts was needed for major impact. This seems to tally with the observation made by Garst (1972: 229) that the Gusii exhibited a ready response to the profitability of innovations but price decline or an uncertain market future had a noticeable effect on the growth curves of adoption.

Garst had earlier on carried out research on Gusii receptivity to new innovations. He found that there was a strong positive relationship between the mean date of adoption, the percentage of farmers adopting the innovation and the intensity of use within the individual sampling areas. He noticed that the first areas to adopt an innovation also tend to be the ones with the highest percentage of farmers who have adopted and where each farmer raises more acres of the crop. He also noticed that with the exception of hybrid maize all innovations exhibited almost the same rate of adoption. The adoption rate of hybrid
maize was much more rapid than for the other innovations because it simply replaced an older crop and it would tend to have more uniformity of acreage per farm because it is a food crop. Finally he observed that due to the limited division of labour both socially and spatially, each part of the study area was much like all other parts, i.e. there was a little range in the size of the farms, size of families, and levels of income from one place to another.

Vail (1972) studied the process of agricultural innovations in Teso District, Uganda, by tracing its historical development. He observes that through the stimulus of forces exogeneous to Iteso culture, small-holder agriculture underwent profound changes. Males became committed to an agrarian way of life and assumed the dominant role in farm decision making; the traditional sharp division of labour was eliminated; and cotton production was universally adopted as a cash crop.

However, he also observes that two conditions necessary for sustained agricultural transformation were lacking, that is, the public and commercial sectors had no act to follow the diffusion of ploughing. Thus Iteso farmers did not articulate a demand for new constraint-releasing innovations. Their predisposition was to respond to, rather than to create, innovation opportunities.
A third observation was with regard to government strategies or programmes and innovation sequences. Vail observes that the department of agriculture was not organized to formulate or implement an integrated developmental strategy. Planning and policy making were dominated by expatriates with great faith in their own research findings but reluctant to learn about farmers and their activities in their fields. They even did not gather and systematically apply second-hand insights about local farming problems from the indigenous extension field staff. The junior extension staff were poorly trained and few in number. It is only through regulation and haranguing by chiefs that simple practices were adopted. It seems that reliance upon this means, rather than agricultural education (formal or informal) minimized Iteso's acquisition of or receptivity to more complex modern farming knowledge necessary for effective use of the sophisticated technology required for further development.

A fourth observation by Vail reveals that the Iteso themselves had little sense of the value of money or of purchased goods; they were not income maximizers. What was important for interpreting Iteso farming patterns was that there was little perceived opportunity to become wealthy or more important in the local community through venturesome farming. Iteso did not utilize education or accumulated wealth to go into commercial enterprise. Prestige was directly linked to farming in only one way, that is, a man was considered
generous and could cultivate respect if he could provide visitors to his house with food and Millet beer.

It seems that, for a traditional community to change its farming practices and to improve performance, there is need for change agents to make an assessment of the appropriate strategies to employ. These strategies or tactics range from the more coercive (e.g. haranguing of farmers by administrative authorities) to the normative ones (e.g. farmer participation) (Jones, 1965: 192-200) Hence the role of a change agent with appropriate strategies is very important.

Many researchers have identified major problems facing small-scale farmers in Africa as being rooted in the authorities responsible for providing extension services to farmers. Bhandari Lax (1973: 152) found that the problems that inhibit Kenyan farmers from rapid growth in agricultural production are "low numbers, poor education and insufficient trained extension workers". This same view is also shared by Leonard (1972a) who has done extensive research on extension service in Kenya generally but in Western Kenya in particular. He has been specially concerned with work performance of extension service and the structure of extension service in the Ministry of Agriculture. He has learned that extension staff tend to improve their effectiveness with one rebriefing every year on each of the important parts of the extension programme in their locale but its impact is relatively
small. Briefings are handled cheaply and simply through lectures delivered by local Agricultural Assistants or Divisional Assistant Agricultural officers at local outdoor meetings; or sometimes they only address their junior staff at pay-day meetings. This poor organization is seen to be at the root of poor performance of the junior extension staff who are actually in contact with the farmers, hence farmers do not get the really recommended practices. Leonard also observes that the low level work effort by extension workers results from dissatisfaction with their employment situation. The persistence of "European" and "African" types of positions in the Ministry of Agriculture perpetuates barriers to responsibility and promotion which injure morale. The junior staff complain about their lack of promotion opportunities, hence miss greater pay. They are also only harangued by their bosses to work hard. In these circumstances then, there is a counter-organization of junior staff and therefore effective supervision of their work becomes extremely difficult.

Moris (1987: 208) sees that:

In Africa extension services offered by a Ministry of agriculture tend to be highly bureaucratic in structure and in their mode of field operation.

The most common characteristic is the steep vertical hierarchy. The junior staff who work in such an organization tend to think of themselves as government servants rather
than as former-advisers. In reality, contact staff are supposed to serve farmers but they find that their most important work relationships are vertical ones to supervisors. In this manner the field agent gets rewarded, disciplined or promoted by bureaucrats located higher in the system. Moris highlights that in any organization, the resources at the workers' command have a pronounced effect in their morale and work productivity. Poor working conditions are seen as the major cause of the low morale in field assignments. It is also common in many African countries for extension staff to see their role as the giving of orders to farmers, an ideal based on the agent's superior mastery of modern farming. Under such situations, farmers are likely to resent whatever is being introduced to them. It has also been found that majority of small-holder farmers do not cope with the changing conditions in farming practices due to extension bias by contact agents. Leonard (1972b: 4) finds that extension attention is very greatly skewed in favour of the more progressive and wealthier farmers. This concentration on progressive farmers is achieved at the expense of the non-innovative ones (1973a).

The findings of Mbithi similarly reflect the cause of poor performance by extension workers as well as the general extension bias, just as Leonard and Moris hold. According to Mbithi (1972: 18):
The bureaucratic organizational nature of the extension system where grass-root extension workers are given deadlines minimizes the role of feedback, continuous programme evaluation and a daptation, and causes these extension workers to falsefy reports and exaggerate meagre achievements.

This kind of behaviour stems from the relationship between senior staff and the junior extension staff which is that between the administrator and the administered. Due to this strict formal relationship, the junior staff do not advise farmers across a wide range of enterprises. These extension agents are also not sufficiently trained to help farmers adopt to the necessary technology at their disposal. Added to this, most of them are not trained communication strategies. By virtue of their training they have little to do with the poor non-progressive farmer.

In terms of the general biases in extension service, it follows that the spread of technical information is directed to the educated farmers, academic audiences and in a language least understood by even the contact extension staff. This general trend leads to information that is distorted, whose meaning makes no sense to the traditional farmer. It is also observed that inputs are packaged in units which are too large and in excess of the requirements of the poorest small-scale farmers who own very small plots. These farmers do not have the money nor the
acreage to use such large quantities. In this case research findings only meet the interests of large-scale farmers. Top farmers are favoured most in that change agents frequently visit them, neglecting the bottom farmers. As that is not enough, these top farmers are able to obtain loans and adopt innovations faster.

From the works cited in the literature, it follows that there are various forces that act upon the traditional small-scale farmers and these might explain their differential response to new agricultural innovations. Moris (1987: 205) has cited a case where small-holder farmers give wisdom to traditional practices in contrast to those contained in recommended technical packages because the latter happened to yield lower than the former. Again, if farm inputs are not supplied to agents or transported to remote areas in time, formers tend to turn to something else at their disposal. Most farmers are still embedded in the growing of food crops just to maintain their subsistence. This restricts their adoption of new technology, especially cash crops. Farmer education, travel, participation in field demonstrations and farm size are likely to determine farmers' adoption of new innovations. Most authors have suggested the availability of credit and market outlets as great incentives to farmers for the adoption of new technology (Vail, 1972; Mbithi, 1972; Swynnerton, 1954).
In view of the foregoing findings, it is true to say that there are many and different factors as well as theories that can explain the farmers' response to agricultural innovations. For example, the farmers' response may be a result of their attitudes towards, or their perception of, an innovation. The way farmers perceive an innovation various from locality to locality or from one individual to the other. People perceive situations differently. The forces underlying their differential perception, and therefore their acceptance or rejection of an innovation are both internal and external. By internal forces is meant factors inherent in the farmers themselves which constitute their personal characteristics e.g. socio-economic rank. External forces on the other hand emanate from influences outside the farmers' personal characteristics e.g. institutional services. These elements tend to create and perpetuate unevenness among small-scale farmers (Uchendu, 1972: 23). In a nutshell, farmers' attitudes towards an innovation result from their differential perception of the innovation, hence giving it a positive response (adoption) or a negative response (rejection). Under the circumstances, a number of issues are here considered as factors which are likely to influence the farmers' response to an innovation:

(a) **Socio-economic Factors**

These refer to the farmers' characteristics, both social and economic. They include a farmers' age; formal
educational level; wealth and operational capital and the size of farming land.

(b) **Situational Factors**

These refer to external factors that actually necessitate production. They include the availability of farm production inputs; the cost of farm production inputs; the distance between input markets and the farms; the availability of credit facilities; produce prices; and the availability of a large labourforce.

(c) **Information Factors**

These refer to external factors that expose the farmers to new ideas and practices (farmer educational media). They include farmers' contacts with extension service agents; social participation informal organizations; use of mass media and contacts with neighbours.
2.2 Theoretical Orientations

Three theoretical frameworks have been adopted as guiding bases for this study. These are the Adoption process Model, the Linear Model and the Middle-class conservatism model. All the three models were used in collecting both quantitative and qualitative data.

2.2.1 The Adoption Process Model

This is a modification of a paradigm suggested by Rogers (1962:305) which shows the adoption of an innovation by individuals. The model contains three phases. These are antecedents, process and result.

The antecedence phase represents the conditions present in a situation prior to the introduction of an innovation. In the case of this study, the antecedents that were considered were the three factors of socio-economic status; the situational context; and informational factors. In the second phase, the process of adoption of the innovation takes place in stages; Firstly, farmers only become aware of the innovation. They should of course show some interest in the innovation. Awareness and interest are followed by evaluation whereby the farmers assess the innovation say, in terms of its advantages and disadvantages. What follows is trial to see how the innovation performs. There is, thus, perception of the characteristics of the innovation. Adoption or non-adoption (rejection) of the innovation forms the third
and last phase and constitutes the result that is, the farmers' response to the innovation which is either positive (adoption) or negative (rejection). It is assumed that the farmers' response to the innovation is an outcome of interacting antecedent factors. The model is diagramatically shown in figure 1.

FIGURE 1: A conceptual model of the Adoption Process.

In addition to the model described above, the adoption of an innovation can be conceptualized in terms of the subjects' behaviour. An explanation of the adoption behaviour runs as follows:
(i) adoption as an ultimate goal or end. In adopting an innovation, farmers seek to attain security. For example, farmers would turn to coffee growing simply because they want to increase their cash income. Their goal in this case is security, that is, the new crop becomes a kind of asset on which to rely should other means of generating income fail. Farmers become more secure because the sources of income are diversified.

(ii) adoption as behavior takes place in situations. Farmers are members of a social system and frequency of interactions with enlightened members of their society has a profound effect on their behaviour.

(iii) adoption of an innovation is normative. Farmers' interaction with others in a social system provide them with a sense of identity and influences their behaviour. For example, the non-adopters of an innovation interacting with the adopters are likely to go by the norms associated with the adoption of that particular innovation, hence they will share similar with the adopters.

(iv) adoption involves an expenditure of effort or motivation. Individuals must exert energy to seek information about the new idea and try it out before adopting it.

The adoption process model is likely to give an explanation as to why some farmers become motivated to adopt
a new crop while others do not. In other words, how do traditional subsistence farmers become motivated or not motivated to adopt market production of crops? What are the incentives that motivated them to adopt coffee? What are the disincentives that inhibit them from adopting the crop? With the variables being measured and the data that was obtained, the adoption process model has provided new insights in the issue under discussion.

2.2.2 The Linear Model

Many studies support the idea that within any community, the wealthier individuals are likely to be the first or principal adopters of new technology - e.g. Rogers (1971) and Pelto (1973) among others. In line with this view, Berry (1980) notes that farmers readiness to take advantage of new income earning opportunities often depends on their assets than on their attitudes. Based on this model, the correlation coefficients are supposed to reveal a linear relationship between two variables, an impression one gets from the saying "the rich get richer and the poor get poorer (see figure 2). This study tested the applicability of this model to the farmers of Ndivisi Location.
2.2.3 The Middle-class Conservatism Model

This model is advanced by Homans (1961) on the basis of evidence from socio-psychological experiments. It is hypothesized that people of very low status and people of very high status were likely to be innovators or adopters of innovations. He argues that low-status individuals are generally of low reputation and could therefore easily adopt behaviour not in conformity with their groups. On the other hand, upper-status people have a secure position and have nothing to gain by conformity, and will also be able to adopt behaviour not normal to the group. It follows that only the middle-class maintains close conformity to traditional or group behaviour. This is a position that
alleges the existence of middle-class conservatism.

The questions raised here are: to what extent is this model valid for farmers in Ndivisi Location? Are those individuals who have responded negatively to coffee production, middle-class? Are the adopters either low-status or high-status people? The model is represented diagramatically below (Figure 3).

![Diagram of the Middle-class Conservatism Model](image)

**FIGURE 3**: The Middle-class Conservatism Model.

### 2.3 Hypotheses

The literature reviewed and the models suggested resulted into the formulation of the following hypotheses as guidelines for data collection and interpretation:
1. Farmers' positive response to coffee growing is determined by a favourable socio-economic status at inception.

2. Farmers' negative response to coffee production is not influenced by situational factors.

3. Farmers' positive response to coffee growing in Ndivisi Location is determined by their degree or level of contact with change agents.

2.4 Definitions of Variables

2.4.1 Independent Variables

These constitute the reasons identified by farmers which necessitate them to give either a positive response or a negative response to coffee production (incentives or disincentives). The positive response and the negative response simply refer to adoption and non-adoption of coffee growing respectively. Independent variables considered here are:

2.4.1.1 Socio-economic status

These are conceptualized as the farmers' characteristics which enable them to have possession of production resources. It is argued here and it is the authors' opinion that these characteristics are determinants of farmers' positive response to coffee production. These characteristics as stated in
the first hypothesis include:

(i) Farmers' age: the old age farmers respond positively to coffee growing than the middle-age or young farmers.

(ii) Formal educational level: farmers with a high formal educational level are likely to respond positively to coffee growing than those whose formal educational level is low.

(iii) Wealth and operational capital: wealthy farmers will respond positively to coffee production than the poorer ones.

(iv) Farm size: farmers with large pieces of land will respond positively to coffee production than those with small farms.

2.4.1.2 Situational Context

This variable is operationalized as external factors or advantages that necessitate the farmers to exploit fully their production resources. These factors are generally important in the agricultural business. However, as viewed in the present study, these are not important in determining farmers' negative response to coffee growing. Situational factors considered here are:

(i) availability of farm production inputs

(ii) cost of production inputs
(iii) distance between input markets and the farms
(iv) availability of credit facilities
(v) availability of a large labour force
(vi) produce prices.

2.4.1.3 Information Factors

These are operationalized as the means by which the innovation can be diffused to the farmers. They determine the degree to which farmers respond to the innovation. It is stated in the last hypothesis that these factors or change agents determine farmers' positive response to coffee growing. They include farmers':

(i) contacts with agricultural extension agents
(ii) social participation in formal organizations e.g. field demonstrations; trade fairs, or agricultural shows; cooperative societies and farmers seminars
(iii) use of mass media,
(iv) contacts with neighbours.

2.4.2 Dependent Variables

Adoption and non-adoption of coffee growing are conceptualized as dependent variables. Adoption refers to farmers positive response to the innovation constituting acceptance and continued production of coffee by farmers, non-adoption refers to farmers' negative response to coffee production, that is, the crop is rejected.
ENVIRONMENTAL SETTING OF NDIVISI LOCATION

Ndivisi Location is situated in Webuye Division of Bungoma District in the Western Province of Kenya. It lies in the eastern part of Bungoma District, bordered by Kimilili Location on the north, Naitiri Location in the east and Webuye and Bokoli Locations on the West. To the southern and south-eastern part of the location is the River Nzoia which forms an administrative boundary between Bungoma and Kakamega Districts. The location is roughly bound by rivers Nzoia and Kibisi; Chetambe (Webuye) Escapement; and the Webuye - Misikhu - Kitale road (maps 1,2 and 3). The total land area is 265 square kilometres.

3.1 Topography and soils

The land rises from 5000ft (1600M) from the south and south-east to 5400ft (1800m) in the north. It is underlain by granitic rock which forms the basement system. The soils in the location are of various types. They range from dark-red friable clays with deep humic top soil, to dark-brown sandy, and grey loams. These are well drained.

The location has a high density of drainage. It is characterized by the presence of numerous streams which are permanent. It is part of the Nzoia basin with its largest tributary, Kibisi.
2.2 Climate and Vegetation

Ndivisi Location is characterized by moderate temperatures for it lies between the higher Mount Elgon zone and the lowlying parts of central and Southern Bungoma. The mean maximum temperatures per year roughly range from 26°C to 30°C while the mean minimum temperatures per year range from 14°C to 18°C. High temperatures are experienced between December and February.

The location receives moderate rainfall, both relief and convectional. Relief rain is influenced the surrounding raised features-Mount Elgon, and the Nandi Hills. Convectional rain is influenced by Lake Victoria. Annual rainfall follows a seasonal pattern ranging from 50 inches (1270mm) to 60 inches (1524mm) per annum. The location thus gets adequate rainfall to support most agricultural activities. The long rains fall between March and August while the short rains fall between September and December.

Natural vegetation in Ndivisi Location ranges from bushland to woodland. Much of the original vegetation is depleted due to the influence of man's activities. Around Webuye Falls (Nabuyole) and along the Chetambe Escarpment is a bushy grassland area, typical of the savannah. In most parts of the location the original trees have been replaced by the exotic ones, eucalyptus, cypress and pine.
3.3 Demography

The dominant ethnic group is Luyia specifically comprising the Bukusu and Tachoni. The location is fairly densely populated and exhibits a high rate of population growth. In 1976 Ndivisi Location had a total population of 38,157 with a growth rate of 1.46 percent per annum. With a total land area of 265 square - kilometres, its population density was 144 persons per square kilometre compared to 141 persons per square kilometre in 1969. In 1979 its total population was 41,741 with a density of 203 persons per square kilometre (Bungoma District Development plan, 1979-1983: 10). This trend in population growth takes the same pattern as that of Bungoma District as a whole. In 1979 the mean population density for Bungoma District was 112 persons per square kilometre, with a growth rate of 5.2 percent per annum, basing on the 1962 population. In 1979 the district had a population density of 164 persons per square kilometre with a population growth rate of 3.85 percent per annum (Kenya population census, 1979, vol.1,p.122).

3.4 Settlement and Land Use

With a fairly dense population, majority plots in Ndivisi Location are small holdings. About 80 percent of the total plots in the location consist of small holdings less than 10 hectares (25 acres) each. In 1970 there were 999 small plots of less than 1.2 hectares
(3.5 acres) in Ndivisi Location (Bungoma District Development Plan, 1979-1983). The number of small plots is directly related to population densities, that is areas with the highest population densities are the ones with many small plots. The number of small plots is also directly related to the soil patterns as well as the intensity of agricultural activities, that is, areas with the most fertile soils are the ones with very many small plots.

Within the district, Ndivisi Location is rated as one of the zones with a high potential for agriculture and intensive farming is practised to a reasonably high degree. Agriculture is the mainstay of the location's economy. Majority of the people are engaged in small-scale mixed farming, growing both food, and cash crops, as well as keeping livestock. The main food crops include maize, beans, finger millet, sorghum, cassava, bananas, cowpeas, sweet potatoes, yams and sim sim. Maize is the main staple food crop but it is a cash crop as well. Beans are also a cash crop and alternate with maize. The purely cash crops grown are coffee, sunflower and sugarcane.

Livestock farming further establishes Ndivisi as a farming location. The main livestock reared include cattle, goats, sheep and poultry.
3.5 Coffee in Ndivisi Location: An Overview

The diffusion of coffee into Ndivisi Location dates back to the 1950s. What is presented in this section is derived from discussions held with the Assistant Manager of the Lukusi Coffee factory, and other sources.

In 1954 a coffee farmers' cooperative society was established at Lukusi by a committee of voluntary farmers from Ndivisi, Khalumuli, Muji and Makuselwa. This is the time coffee was introduced into Bungoma District from Kisii and Kakamega, following encouragement given by the Kenya Planters' Cooperative Union (KPCU). In the period 1955/1956 coffee growing by farmers in Ndivisi began. This was achieved through encouragement by the area chief in organizing local meetings (barazas) thereby disseminating the information to farmers. No coercive means were used to involve the farmers. During this period, coffee seedlings were obtained from other areas that had set up their own nurseries, the major one being Chwele, some forty Kilometres from Lukusi. The seedlings were not being given free of charge. They were purchased at a certain amount depending on the number required. Currently a coffee seedling costs two shillings.

This major trend led to the establishment of a coffee pulping plant. Parallel to this development was the establishment of a coffee nursery from where farmers could purchase the seedlings. The nursery and factory area occupy land area of about five acres. The cooperative society offices
and the factory occupy the same premises and are affiliated to the Bungoma branch of the Kenya National Farmers Union (KNFU), located in Bungoma town.

As it was stated earlier on, no African farmers had been allowed by the colonial authority to grow cash crops but following the swynnerton Plan (1954) there was a general mobilization of the African economy as part of government policy. Intensification in farm production accrued from the incentives released by the swynnerton plan. As a result there was an increase in the number of coffee farmers in the years preceeding independence and those immediately following independence.

In the period after independence, however, many parts of Western Province experienced a general decline in agricultural production and output of the average rural population. In other words, the period after independence experienced a shift from dependence on farm produce; young men moved into urban centres leaving behind the old folk and children who could not work the land (Ogutu, 1975).

This view was also expressed by the respondents. According to them the period following independence saw a decline in the number of coffee farmers due to the low prices that were being offered for the crop, a kilogram earned as little as sixty cents. However, they offered no comparison
with other areas at the time which tended to experience an increase in the number of coffee growers. Asked about the present situation, the Lukusi farmers declared that they are being paid less compared to areas like Mount Elgon, Kisii and central Kenya where coffee farmers earn as much as five shillings per kilogramme of coffee compared to theirs which earns three shillings per kilogramme for the best grade. They could not explain the cause of such a difference. However, further investigation revealed that the prices are determined by the quality of the produce which is normally graded. If the crop is not properly cared (e.g. in adequate application of nutrients; poor weeding, poor harvesting and poor storage) its quality is lowered, hence fetching low prices. Another reason that was given is that some farmers migrated into the newly created settlement schemes that had formerly been occupied by the white settlers.

The cooperative movement and its nature of operation contributed a lot to his trend of fluctuation in production. According to Ogutu (1985) the operation of the cooperative societies, charged with the marketing of the crop, were well organized and maintained in the pre-independence period. However, there arose what Ogutu regards as a "political fever of independence" whereby there was a rapid increase in the number of cooperatives, political agitation never allowed them to function satisfactorily. Hence splinter societies rose, the number of members of the existing ones dropped
and so was the decline in production output; the emergence of poor administration and embezzlement of funds were also witnessed. According to the 1966 Cooperatives Commission, the cooperative movement had become defunct. In the late 1960s, however, farmers were encouraged to take up to coffee growing, the number rising tremendously in the 1970s. This was a result of the new government's policy, contained in the first Five Year Development, whose aim was to stabilize the agricultural economy that had been unstable. Table 1 shows figures for coffee production in tons for Bungoma, Kakamega and Meru districts as well as the country's total production in the period 1962-1966. The table tries to show how coffee production underwent fluctuations. Note that although Meru District (the district was the leading producer in the whole country) and the country in general experience these fluctuations, they exhibited a greater increase in the recovery period compared to Western Province.

<table>
<thead>
<tr>
<th></th>
<th>1962/63</th>
<th>1963/64</th>
<th>1964/65</th>
<th>1965/66</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bungoma</td>
<td>589</td>
<td>638</td>
<td>366</td>
<td>433</td>
</tr>
<tr>
<td>Kakamega</td>
<td>29</td>
<td>113</td>
<td>89</td>
<td>140</td>
</tr>
<tr>
<td>Meru</td>
<td>2437</td>
<td>4278</td>
<td>3942</td>
<td>6230</td>
</tr>
<tr>
<td>Kenya(Total)</td>
<td>8701</td>
<td>15131</td>
<td>14542</td>
<td>25120</td>
</tr>
</tbody>
</table>

Table 1: Coffee production in tons for the period 1962-66.
(Source: Coffee Board of Kenya: Annual Report, 1966, p.8)
The period 1966 to 1978 has been described as an "era of reform and revitalization." The 1966 Cooperatives Commission recommended a reorganization of the whole cooperative movement, especially the cooperative societies. Through the spirit of "African Socialism" there was a call for quantitative and qualitative expansion of all the facilities in the movement and the government attempted to revive the dead and dying societies. To make the cooperatives an instrument of rural development, the cooperative Act, 1966, was passed. By this Act, the government planned a re-establishment of the weak societies and to liquidate the dead ones. Despite government efforts, some cooperative societies still remained the loci of political agitation instead of being a channel of economic and social change. Cases of embezzlement, open fraud, and theft were recurrent. The whole episode of corruption in Kenya was brought to an end in the era after 1978. This is the Nyayo era, a period of true reform and revitalization of the movement. This period of action saw the creation of the Ministry of Cooperatives and cleansing of corrupt elements in the societies. Hence the production of coffee has taken an upward trend.

It is important to conclude this chapter by a discussion of the Lukusi Coffee Farmers' Cooperative Society.

The official register (without a reference number) shows that there are over six hundred fully registered members. A farmer is considered a full member of the society on payment of a full membership fee of five hundred shillings. Such a member enjoys all the benefits accruing from the society.
Those who are not full members form a majority number. The society by virtue of its name, does not serve farmers from Lukusi area only, but covers a wider area. The areas served include Mihuu, Makemo and Ndivisi sub-locations – these are areas within Ndivisi Location. In addition, the society caters for coffee growers outside Ndivisi Location. These include Kibisi in Na'itiri Location and parts of Bokoli Location.

A farmer begins to grow coffee once he or she is registered. One can grow the crop as long as he or she can maintain it. The land area for the crop is determined by the number of coffee trees desired. Farmers often talk in terms of the number of coffee trees they own rather than the acreage under the crop. The more progressive farmers have as much as one thousand trees (about two acres) or more while the beginners have as few as twenty. Thus the crop requires a relatively small acreage of land compared to maize. The cooperative society advances both short-term (seasonal) loans and long-term loans to willing farmers. The loans are repaid through deductions from a farmer's net returns, since the cooperative society is the channel for marketing the produce.

For purposes of providing extension services, a certain number of coffee growers is allocated to a coffee specialist. These agents are in charge of inspection of the crop; giving guidelines on new strategies and organizing of field demonstrations and seminars. As Brown (1963:11) observed:
"Coffee has the supreme advantage of being relatively easy to grow and it does not require costly nurseries or even expensive processing machinery."
Map 1: A sketch map of Bungoma District showing the position of Ndivisi Location

(Source: Daily Nation, March 6, 1989; p. 12)
Administrative Divisions and Population Density per square kilometre in 1969
N.K. = North Kulisiru Sub-location
S.K. = South Kulisiru Sub-location

Map 2. *Bungoma District* Scale 1 : 400,000

(Source: De Wolf J.J., 1977; p. 3)
Map 3. Bungoma District  Scale 1 : 400,000
Communications and settlements

(Source: De Wolf, J.J.; 1977, p. 4)
Map 4. *Bungoma District*  Scale 1 : 400,000
Altitude and rainfall

(Source: De Wold, J.J. 1977; p. 5)
CHAPTER 4

METHODOLOGY

4.0 Data Collection

Sources of data and accompanying methods included documentary analysis; administering personal face-to-face interviews to research subjects; and participant observation. In addition there were also formal discussions with the coffee extension agents; officials of the Lukusi Coffee Farmers' Cooperative Society and officials of the Lukusi Coffee pulping plant. Two types of data were collected, that is, quantitative (statistical) data and qualitative (non-statistical) data. Interviews were used to collect quantitative data. In this case, the unit of observation (respondent) was the farmer who owned a plot within the study area and who appeared in the sample. Participant observation and formal discussions were used to collect qualitative data. The process of collecting data was mainly undertaken by the author. The actual exercise in the field commenced in early May and ended in late June of 1989.

4.1 Sampling

Before drawing a final sample, two considerations had to be made. First, the sample size was to be in such a way that it is manageable. The area covered, Lukusi, consists of three villages of Lukusi, Misimo and Bakisa. The three villages combined constitute about five hundred farms. The population from which the sample was drawn
consisted of one hundred and eighty elements (farmers) which was considered convenient for the limited time in which the work was to be carried out. The second consideration was in respect of the two categories of research subjects, that is, the coffee adopters and the non-adopters. It was necessary to select them in equal proportions so that the element of bias was avoided as much as possible.

4.1.1 The Population

The population for study consisted of one hundred and eighty farmers who owned plots within Lukusi area. Two methods were used to obtain this population. First, it was necessary to identify the coffee growers. Their names were obtained from the Lukusi Coffee Farmers' Cooparative Society. One hundred Coffee growers were identified. A second step was a cross-survey of the whole area to identify the non-growers. Again one hundred non-coffee growers were identified. The final population, which formed the sampling frame, was obtained by selecting ninety elements from each category using the lottery method. Altogether there were one hundred and eighty elements which formed the population and therefore the sampling frame from which the final study sample was drawn.

4.1.2 Sampling Procedure

From what is outlined above, it is true to say that some form of multi-stage sampling was used. The particular method of sampling that was used is simple random sampling. The objective behind its use was to give each member of the
population an equal chance of being selected only once with the population involved likely to be evenly represented.

From the selected sample of one-hundred and eighty individuals, another simple random sample of ninety individuals was selected using the same lottery method. The sample thus represented fifty percent of the population. Each individual in the population was represented on a piece of paper on which the name was written and folded. One-hundred and eighty pieces of paper were mixed up in a box and thoroughly shaken. The pieces were picked one at a time without being replaced. The sampling fraction was therefore, not kept constant. Out of the final sample that was selected, 56.7 percent (51 individuals) were coffee adopters, while the non-adopters represented the remaining 43.3 percent (39 individuals).

4.2 Interviews

To collect quantitative data, a prepared structured-questionnaire was administered to respondents. Before administration, the questionnaire which was in English, was translated into local dialects; Tachoni and Bukusu. The questions were open-ended. This format was preferred to pre-coded or closed questions to allow for probing deeply into aspects which could be concealed. Thus the respondents had a chance to express their views with maximum freedom and in detail. The interview method was used because of its quick advantage over other methods of data collection given that the research period was very short. The
questionnaire had to be administered to a few individuals in the neighbouring village of Lutacho. The necessary alterations were made to make it applicable to the prevailing conditions, to ensure clarity and consistency.

The task of interviewing the respondents was a daily routine. Each respondent was informed of the exercise well in advance so that some kind of rapport was established in the first instance. This enabled the respondent to avail himself or herself in the appropriate time. Since the author is from the area and is competent in the local dialects, the need for interpreters did not arise. The questions that were posed to the farmers roughly covered three areas; the farmers' socio-economic characteristics; their reasons for adopting and not adopting cultivation of coffee; and systems of information about the crop which they might have encountered. Most interviews took place in the farms and some at local market centres, the coffee factory and in the grazing fields.

For each item in the questionnaire, a corresponding response was recorded in the same order for every respondent (Appendix I). The main items included in the interview schedule are listed in Appendix II.

4.3 Participant-observation.

Complementary to the interview technique was the participant-observation method of data collection. This method was possible on account that the researcher is from
the community under study. Previous experience and participation in community activities necessitated its application as a method of data collection. Unlike the interview method, participant-observation was aimed at collecting qualitative data which were to be compared and contrasted with quantitative data. Participant-observation helped the researcher grasp the real situation better than what the respondents could give when asked. Like the interview method, participant-observation also focussed on three variables pertaining to the adoption and non-adoption of coffee production by farmers, that is, characteristics of the farmers' socio-economic status; situational factors; and informational factors.

For socio-economic characteristics, it was vital to observe farmers' possessions and other attributes to determine the degree of their wealth. For instance, farmers who had large numbers of livestock, permanent houses, diversified sources of income and expensive items, were rated at being rich or economically sound. Farmers who owned few or no livestock, temporary houses, had scarce income sources and less expensive items, were rated as being poor or economically handicapped. Those who fell in between these categories were considered as being moderate or economically fair. The farmers' literacy level was determined by observing the types of books or newspapers they read, the language they used in local barazas, chiefs' meetings or in church e.g vernacular, Kiswahili or English. Through observation, farm sizes were rated as small (less than ten acres); medium (between ten and twenty acres) and large (over twenty acres).
The researcher participated in activities that involved the supply of farm-production inputs; observation of modes of transporting inputs such as vehicles, ox-carts, sledges or human potterage; as well as participation in transporting the produce to the coffee factory to obtain data on situational factors.

For informational factors, it was necessary to observe and participate in field demonstrations; attend farmers' meetings; observe farmer-extensionist interactionism; as well as farmer-to-farmer interactionism. Through informal discussions, it was also possible to observe the types of farmers' newspapers, newsletters and magazines they read.

4.4 Documentary Analysis

A number of works provide background information to the area under study in the fields of history and settlement (Were, 1967: 84-95); agricultural innovations (Misiko, 1976; Ogutu, 1985); and other general development programmes (Thurman, 1968). A review of the existing literature on agricultural innovations was undertaken from various materials e.g. books, journals, working/discussion papers, reports, statistical abstracts, and development plans; found in libraries, the central bureau of statistics and the district development office. Records in the coffee cooperative society and the factory at Lukusi also generated valuable information.
4.5 Problems Encountered in the Field

4.5.1 Nature of teh Season.

The study was conducted during the busiest season of the year. Within this area, as in other parts of Western Province, the period between March and June is one in which farmers are usually busy in their farms. Planting of crops (maize, beans, millet, sorghum, etc) and weeding are the major preoccupations. As a result of this most farmers would not be interviewed as arranged, which forced the researcher to spend more time than planned. Some farmers gave priority to their own work although they were duly informed in advance. Thus the interviewing exercise would take place according to a farmer's willingness to be interviewed at the time he or she felt, was suitable and not according to the researcher's decision. Some farmers who owned several plots (this is a polygamous community) could not be spotted at the expected home. This called for making fresh appointments and adjusting the time schedule, hence placing a constraint on time allocation.

The season is also characterized by food shortages. Males, who happen to be the farm decision makes, are involved in various activities to obtain money for procuring food. Travelling on bicycles for long distances in search of grains to buy is a recent and common phenomenon in the area. Some men, and sometimes women, are employed as farm workers on part-time basis to earn money in order to sustain a living.
The unexpected absence of such people in their homes posed a problem of delay before proper time for the interview could be found. Sometimes heavy rains and mud could curtail a day's business by making some parts of the study area quite inaccessible. Some respondents could not be traced easily because they went grazing their animals. Such situations caused delays and other inconveniences.

4.5.2 Poor Farm Records

Some respondents did not have any records of their day to day transactions. For example, most of them did not have any records showing their expenditure on farm production or income from their produce. Lack of records meant that reliance was placed upon their own estimation of expenditure and income. The result of this is that most respondent tended to make exaggerations.

4.5.3 Mortality

Most research subjects in the sample could not be found as anticipated. These included those employed far away from their homes and others who were long diseased although the registers still bear their names. There was also a case where a respondent was arrested and sentenced to imprisonment for possessing an illicit brew. This differential loss of research subjects was only solved by purposeful replacement.
4.5.4 Nature of the Research Instrument

Some respondents were uncooperative when asked on issues they perceived to be sensitive such as age and income which they considered a private affair. Their cooperation could only be cultivated by assurance that everything would be taken strictly confidential. Some respondents demanded some form of payment for their information. This was more so to those who were not familiar with the researcher but on explaining the objective of the exercise and through exercising honesty, they would reverse their mind. Some respondents mistook the researcher for a new extension worker and would welcome him with blames for failing to be in touch with them. They apologized on establishing the researcher's identity.

4.5.5 Time factor

Interviews were conducted on a face-to-face basis rather than sending out questionnaires to individual respondents. A lot of time was spent on asking questions and at the same time recording down the responses given by the respondents. It took a lot of time to complete a discussion with a single respondent. As for the researcher this was not a problem but for the respondents, they tended to be brief and thus limit their answers. It could be it was because they were constrained with time or that they were not interested in providing full cooperation.
4.6 **Data Analysis**

Analysis involved a description of the characteristics of the respondents in relation to the measured variables. The actual number and percentage distribution were used to describe the sample. For qualitative data, analysis involved description of observed impressions emanating from participant-observation. For quantitative data statistical measures were used in computing data for each variable which involved drawing frequencies and tabulation; analysis of the mean as a measure of central tendency in a frequency distribution based on the formula.

\[
\bar{X} = \frac{1}{n} \sum X_i
\]

where \( \bar{X} \) is the mean; \( n \), the number of values or observations and \( \sum X_i \), the sum of values.

Analysis of measures of variation or dispersion, that is, the variance, the standard deviation and the range, was done using the following formulae:

- Variance, \( S^2 = \frac{1}{n} \sum (X_i - \bar{X})^2 \)

- Standard deviation, \( S = \sqrt{\frac{1}{n} \sum (X_i - \bar{X})^2} \)

- Range = \( L - S \), where \( L \) is the largest value and \( S \) the smallest value in a frequency distribution.
Analysis of the Pearson's-product-moment correlation coefficient between two variables, X and Y, was based on the formula.

\[ r = \frac{\frac{1}{n} \sum XY - (\bar{X})(\bar{Y})}{\sqrt{\left(\frac{1}{n} \sum X^2 - (\bar{X})^2\right) \left(\frac{1}{n} \sum Y^2 - (\bar{Y})^2\right)}} \]

Where \( \bar{X} \) is the mean of the values in the X variable and \( \bar{Y} \) is the mean of the values in the Y variable.

And, lastly a scattergram test was employed.
The objective in this chapter is to search and identify meaningful patterns of relationship in the data; to answer the research problem and to test the formulated hypotheses. Analysis of data involved examination and interpretation of the three base factors which expose the general environmental conditions of the population. These factors are socio-economic, situational and informational.

5.1 POINTERS OF SOCIO-ECONOMIC STATUS

The variables measured here in relation to adoption or non-adoption of coffee production by farmers within Lukusi area are the respondents' ages, formal educational level, wealth and operational capital, and farm size.

5.1.1 Ages of Farmers

On the basis of this variable, respondents were categorized as:

(a) young: those below 35 years of age
(b) middle-aged: respondents ranging from 35 years to 55 years
(c) old-age: respondents over 55 years of age.
The data obtained in respect of this criterion, for the whole sample and expressed in actual numbers of respondents and in percentage figures are presented in table 2.

<table>
<thead>
<tr>
<th>CATEGORIES OF FARMERS</th>
<th>ADOPTERS</th>
<th>NON-ADOPTERS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO.</td>
<td>%</td>
<td>NO.</td>
</tr>
<tr>
<td>Young</td>
<td>3</td>
<td>3.3</td>
<td>3</td>
</tr>
<tr>
<td>Middle-age</td>
<td>22</td>
<td>24.5</td>
<td>20</td>
</tr>
<tr>
<td>Old-age</td>
<td>26</td>
<td>28.9</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>56.7</td>
<td>39</td>
</tr>
</tbody>
</table>

Table 2: Farmer-Categories by age.

Another method that was used to categorize the respondents on the basis of age was the use of age groups. The sample contained respondents ranging from the twenties to the eighties. This is shown, in the form of grouped data, in table 3

<table>
<thead>
<tr>
<th>AGE-GROUP</th>
<th>NUMBER OF RESPONDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADOPTERS</td>
</tr>
<tr>
<td>20-29</td>
<td>1</td>
</tr>
<tr>
<td>30-39</td>
<td>3</td>
</tr>
<tr>
<td>40-49</td>
<td>12</td>
</tr>
<tr>
<td>50-59</td>
<td>12</td>
</tr>
<tr>
<td>60-69</td>
<td>8</td>
</tr>
<tr>
<td>70-79</td>
<td>10</td>
</tr>
<tr>
<td>80-89</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 3: Distribution of farmers by age-groups
In order to establish the mean ages in the two samples, and to discern variations in age, a frequency distribution was drawn for each category of respondents, that is, adopters and non-adopters. These are shown in table 4.

<table>
<thead>
<tr>
<th>ADOPTERS</th>
<th>63</th>
<th>82</th>
<th>NON-AOPTERS</th>
<th>50</th>
<th>63</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>50</td>
<td>82</td>
<td>30</td>
<td>50</td>
<td>63</td>
</tr>
<tr>
<td>34</td>
<td>51</td>
<td>82</td>
<td>31</td>
<td>50</td>
<td>64</td>
</tr>
<tr>
<td>34</td>
<td>52</td>
<td>84</td>
<td>34</td>
<td>50</td>
<td>65</td>
</tr>
<tr>
<td>38</td>
<td>53</td>
<td>65</td>
<td>37</td>
<td>51</td>
<td>65</td>
</tr>
<tr>
<td>40</td>
<td>53</td>
<td>70</td>
<td>38</td>
<td>53</td>
<td>66</td>
</tr>
<tr>
<td>40</td>
<td>54</td>
<td>71</td>
<td>40</td>
<td>54</td>
<td>68</td>
</tr>
<tr>
<td>40</td>
<td>54</td>
<td>71</td>
<td>41</td>
<td>54</td>
<td>70</td>
</tr>
<tr>
<td>44</td>
<td>55</td>
<td>73</td>
<td>44</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>55</td>
<td>74</td>
<td>44</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>56</td>
<td>75</td>
<td>45</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>57</td>
<td>76</td>
<td>46</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>58</td>
<td>76</td>
<td>47</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>60</td>
<td>77</td>
<td>47</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>61</td>
<td>78</td>
<td>48</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>61</td>
<td>81</td>
<td>49</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>63</td>
<td>81</td>
<td>49</td>
<td>62</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Distribution of age in the sample:
From the frequency distribution in table 4, the mean age, range, variance and the standard deviation of the three age categories for each of the two respondent samples were calculated.

(a) **Adopters:**

(i) **young farmers,** \( x_1 = 29, 34, 34. \)

mean, \( \bar{x} = \frac{1}{n} \sum x_i \)

\[
= \frac{1}{3} \times 92. = 32.3
\]

\( = 32 \text{ years} \)

Range = \( L - S = 34 - 29 = 5 \)

\( = 5 \text{ years} \)

Variances, \( s^2 = \frac{1}{n} \sum (x_i - \bar{x})^2 \)

\[
= (x_1 - \bar{x})^2 = 9
\]

\[
= (x_2 - \bar{x})^2 = 4
\]

\[
= (x_3 - \bar{x})^2 = 4
\]

\[
\sum (x_i - \bar{x})^2 = 17
\]

\[
s^2 = \frac{1}{3} \times 17 = 5.66
\]

\( = 5.7 \)
Standard deviation, \( s = \sqrt{\frac{1}{n} \sum (x_i - \bar{x})^2} \)

\[ = \sqrt{\frac{1}{3} \times 5.7} = \sqrt{2.38} \]

\[ = 2 \]

(ii) Middle-age farmers:

\( x_i = 38, 40, 40, 40, 44, 44, 45, 45, 45, 46, 46, 48, 49, 50, 51, 52, 53, 53, 54, 54, 55, 55, 55. \)

mean, \( \bar{x} = \frac{1}{n} \sum x_i \)

\[ = \frac{1}{22} \times 1047 = 47.59 \]

\[ = 48 \text{ years.} \]

Range = \( L - S = 55 - 38 = 17 \)

\[ = 17 \text{ years.} \]

variance, \( s^2 = \frac{1}{n} \sum (x_i - \bar{x})^2 \)

\[ = \frac{1}{22} \times 609 = 27.68 \]

\[ = 27.68 \]

standard deviation = \( \sqrt{27.68} = 5.26 \)

\[ = 5.3 \]
(iii) Old-age farmers:

\[ x_i = 56, 57, 58, 60, 61, 61, 63, 63, 63, 64, 65, 70, 71, 71, 73, 74, 75, 76, 76, 77, 78, 81, 81, 82, 82, 84 \]

Mean, \( \bar{x} = \frac{1}{n} \sum x_i \)

\[ = \frac{1}{26} \times 1822 = 70 \]

= 67 years

Range = \( L - S = 84 - 56 \)

= 28 years

Variance, \( s^2 = \frac{1}{n} \sum (x_i - \bar{x})^2 \)

\[ = \frac{1}{26} \times 1942 \]

\[ = 74.69 \]

Standard deviation, \( s = \sqrt{74.69} \approx 8.757 \)

= 8.76

(b) Non-adopters

(i) Young farmers

\[ x_i = 30, 31, 34. \]
Mean, $\bar{x} = \frac{1}{n} \sum x_i$

$= \frac{1}{3} \times 95 = 31.66$

$= 32$ years.

Range $= L - S = 34 - 30$

$= 4$ years

Variance $= \frac{1}{n} \sum (x_i - \bar{x})^2$

<table>
<thead>
<tr>
<th>$x_i$</th>
<th>$(x_i - \bar{x})$</th>
<th>$(x_i - \bar{x})^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>31</td>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>34</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

$\sum (x_i - \bar{x})^2 = 9$

$s^2 = \frac{1}{3} \times 9 = 3$

$= 3$

Standard deviation, $s = \sqrt{\frac{1}{n} \sum (x_i - \bar{x})^2}$

$= \sqrt{3}$

$= 1.73$

(ii) Middle-age farmers

$x_i = 37, 38, 40, 41, 44, 44, 45, 46, 47, 47, 48, 49, 49, 50, 50, 50, 51, 53, 54, 54.$
mean, $\bar{x} = \frac{1}{n} \sum x_i$

$$= \frac{1}{20} \times 9810 \quad 49.05$$

$$= 49 \text{ years.}$$

Range, $= L - S = 54 - 37$

$$= 17 \text{ years}$$

Variance, $s^2 = \frac{1}{n} \sum (x_i - \bar{x})^2$

$$= \frac{1}{20} \times 565 \quad 28.25$$

$$= 28.25$$

standard deviation $= \sqrt{28.25} = 5.315$

$$= 5.3$$

(iii) **Old-age farmers'**

$x_i = 56, 57, 57, 58, 61, 61, 62, 62, 62, 63, 64, 65, 65, 66, 68, 70.$

mean, $\bar{x} = \frac{1}{n} \sum x_i$

$$= \frac{1}{16} \times 997 \quad 62.31$$

$$= 62 \text{ years}$$

Range, $= L - S = 70 - 56$

$$= 14 \text{ years}$$
variance, \( s^2 = \frac{1}{n} \sum (x_i - \bar{x})^2 \)

\[ = \frac{1}{16} \times 243 \quad 15.187 \]

\[ = 15.19 \]

standard deviation = \( \sqrt{15.19} = 3.897 \)

\[ = 3.9 \]

The relationship between age and adoption or non-adoption of coffee was measured by comparing the ages of the respondents and the number of adopters or non-adopters. A statistic that was considered appropriate for this measurement was the Pearson's product-moment correlation coefficient. Correlation is the degree to which variation in one variable corresponds to or is related to variation in another variable, hence the idea of covariation. Using a correlation coefficient, we can establish whether the relationship between two variables is perfect (linear); positive or negative; high or low; or whether there exists no correlation at all. The correlation coefficient increases or decreases as the strength of the relationship increases or decreases.

The Pearson's product-moment correlation coefficient, \( r \), is derived as:

\[ r = \frac{\text{cov}}{s_x s_y} \]
where cov, is the variance; $s_x$ is the standard deviation on the $x$ variable, and $s_y$ is the standard deviation on the $y$ variable. For computational purposes the following formulae are used:

$$s_x = \sqrt{\frac{1}{n} \sum x_i^2 - \bar{x}^2}$$

$$s_y = \sqrt{\frac{1}{n} \sum y_i^2 - \bar{y}^2}$$

$$\text{cov} = \frac{1}{n} \sum x_i y_i - \bar{x} \bar{y}$$

$$r = \frac{\frac{1}{n} \sum x_i y_i - \bar{x} \bar{y}}{\sqrt{\left(\frac{1}{n} \sum x_i^2 - \bar{x}^2\right) \left(\frac{1}{n} \sum y_i^2 - \bar{y}^2\right)}}$$

In the workings that follow the $x$ variable represents age and the $y$ variable represents the number of adopters or non-adopters. The units in the $x$ variable are derived from the age-group figures in table 3. These have been reduced as a matter of convenience. Each age category is given a corresponding number of respondents. Table 5 shows the method of calculating the correlation coefficient between age and adoption as derived from the data in table 3.
Table 5: Calculation of correlation coefficient between age and adoption.

The first step is to calculate the mean for both $x$ and $y$ variables, thus

$$\bar{x} = \frac{1}{n} \sum x_i = \frac{1}{7} \times 35 = 5$$

$$\bar{y} = \frac{1}{n} \sum y_i = \frac{1}{7} \times 51 = 7$$

Next is to find cov, $s_x$ and $s_y$

$$\text{cov} = \frac{1}{n} \sum x_i y_i - (\bar{x})(\bar{y})$$

$$= (\frac{1}{7} \times 277) - (5)(7) = 39.57 - 35 = 4.57$$

$$= 5.6$$
The correlation coefficient between age and adoption is seen to be positive. However, it is not a perfect positive correlation, neither is it positively low (weak) nor positively high (strong) i.e. it is not close to zero and it is not close to one.

This correlation between age and adoption is shown on a scatter diagram in figure 4.
FIGURE 4: Scatter diagram showing the relationship between age and adoption.

Calculation of correlation coefficient between age and non-adoption followed the same procedure. The data for this are also derived from table 3.

<table>
<thead>
<tr>
<th>$x_i$</th>
<th>$y_i$</th>
<th>$x_i^2$</th>
<th>$y_i^2$</th>
<th>$x_i y_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>5</td>
<td>9</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>16</td>
<td>121</td>
<td>44</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>25</td>
<td>121</td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>36</td>
<td>121</td>
<td>66</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>49</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

$\Sigma x_i = 25 \quad \Sigma y_i = 39 \quad \Sigma x_i^2 = 135 \quad \Sigma y_i^2 = 389 \quad \Sigma x_i y_i = 187$

Table 6: Calculation of correlation coefficient between age and non-adoption.
First we calculate the mean for both variables, thus

\[
\overline{x} = \frac{1}{5} \times 25 = 5
\]

\[
\overline{y} = \frac{1}{5} \times 39 = 5.57 = 6
\]

Next we find Cov, \( s_x \) and \( s_y \).

\[
cov = \frac{1}{n} \sum_{i=1}^{n} x_i y_i - (\overline{x})(\overline{y})
\]

\[
= \left( \frac{1}{5} \times 187 \right) - (5) (6) = 37.4 - 30 = 7.4
\]

\[
s_x = \sqrt{\frac{1}{n} \sum_{i=1}^{n} x_i^2 - (\overline{x})^2} = \left( \frac{1}{5} \times 135 \right) - (5)^2 = 27 - 25 = 2
\]

\[
= 1.4
\]

\[
s_y = \sqrt{\frac{1}{n} \sum_{i=1}^{n} y_i^2 - (\overline{y})^2} = \left( \frac{1}{5} \times 389 \right) - (6)^2 = 77.8 - 36
\]

\[
= \sqrt{41.8} = 6.46 = 6.5
\]

\[
r = \frac{cov}{s_x s_y} = \frac{7.4}{1.4 \times 6.5} = \frac{7.4}{9.1} = 0.813
\]

\[
= 0.813
\]
This correlation between age and non-adoption is tested by the use of a scatter diagram as shown in Figure 5.

![Figure 5: A scatter diagram showing the relationship between age and non-adoption.](image)

The correlation coefficient between age and non-adoption is seen to be positive and high. However it is not perfect since it does not show a one-to-one relationship between the two variables.

5.1.2 **Formal Educational Level**

To measure this variable in relation to adoption and non-adoption, respondents were categorized into three groups:
(a) those without any formal education. These were coded zero (0)
(b) those with basic formal education (primary school level.) These were coded five (5) and were labelled as having 'low' education.
(c) those who had had post-primary education. These were coded ten (10) and were labelled as having 'high' education.

The sample distribution of respondents on the basis of this criterion is shown in tables 7 and 8.

<table>
<thead>
<tr>
<th>Formal Educational Level</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No education</td>
<td>14</td>
<td>27.5</td>
</tr>
<tr>
<td>Low</td>
<td>28</td>
<td>54.8</td>
</tr>
<tr>
<td>High</td>
<td>9</td>
<td>17.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>51</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 7: Distribution of respondents by formal educational level for adopters.

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No education</td>
<td>13</td>
<td>33.3</td>
</tr>
<tr>
<td>Low</td>
<td>24</td>
<td>61.5</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
<td>5.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>39</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 8: Distribution of Respondents by formal educational level for non-adopters
A correlation coefficient was calculated for each of the two types of respondents to ascertain the relationship between formal educational level (x variable) and adoption or non-adoption (y variable). The x variable is represented by the code number for each level of education while the y variable is represented by the actual number of respondents.

<table>
<thead>
<tr>
<th>(x_1)</th>
<th>(y_1)</th>
<th>(x_1^2)</th>
<th>(y_1^2)</th>
<th>(x_1y_1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>14</td>
<td>0</td>
<td>196</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>28</td>
<td>25</td>
<td>784</td>
<td>140</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>100</td>
<td>81</td>
<td>90</td>
</tr>
</tbody>
</table>

\(\Sigma x_1 = 15\) \(\Sigma y_1 = 51\) \(\Sigma x_1^2 = 125\) \(\Sigma y_1^2 = 1061\) \(\Sigma x_1y_1 = 230\)

Table 9: Calculation of correlation coefficient between formal educational level and adoption

In table 9,

\[ \bar{x} = \frac{1}{n} \Sigma x_1 = \frac{1}{3} \times 15 = 5 \]

\[ \bar{y} = \frac{1}{n} \Sigma y_1 = \frac{1}{3} \times 15 = 17 \]

\[ \text{cov} = \frac{1}{n} \Sigma x_1y_1 - (\bar{x})(\bar{y}) = (\frac{1}{3} \times 230) - (5 \times 17) = 17.6 - 85 = -8.3 \]

\[ S_X = \sqrt{\frac{1}{n} \Sigma x_1^2 - (\bar{x})^2} = \sqrt{(\frac{1}{3} \times 125) - (5)^2} = \sqrt{41.7 - 25} = \sqrt{16.7} \]

\[ = 4.1 \]
The correlation coefficient between formal educational level and adoption is negative and low (weak), hence there is no clear relationship between the two variables. The correlation coefficient between formal educational level and non-adoption is worked using Table 10.

<table>
<thead>
<tr>
<th>$x_i$</th>
<th>$y_i$</th>
<th>$x_i^2$</th>
<th>$y_i^2$</th>
<th>$x_i y_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>13</td>
<td>0</td>
<td>169</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>24</td>
<td>25</td>
<td>576</td>
<td>120</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>100</td>
<td>4</td>
<td>20</td>
</tr>
</tbody>
</table>

$\Sigma x_i = 15 \quad \Sigma y_i = 39 \quad \Sigma x_i^2 = 125 \quad \Sigma y_i^2 = 749 \quad \Sigma x_i y_i = 140$

Table 10: Calculation of correlation coefficient between formal educational level and non-adoption.

In Table 10,

$\bar{x} = \frac{1}{n} \Sigma x_i = \frac{1}{3} \times 15 = 5$

$\bar{y} = \frac{1}{n} \Sigma y_i = \frac{1}{3} \times 39 = 13$
\[
\text{cov} = \frac{1}{n} \sum x_i y_i - (\bar{x})(\bar{y}) = \left(\frac{1}{3} \times 140\right) - (5) (13)
\]
\[
= 46.7 - 65 = -18.3
\]
\[
s_x = \sqrt{\frac{1}{n} \sum x_i^2 - (\bar{x})^2} = \left(\frac{1}{3} \times 125\right) - (5)^2
\]
\[
= 41.7 - 25 = 16.7
\]
\[
= 4.1
\]
\[
s_y = \sqrt{\frac{1}{n} \sum y_i^2 - (\bar{y})^2} = \left(\frac{1}{3} \times 749\right) - 169
\]
\[
= \sqrt{249.7 - 169} = \sqrt{80.7} = 8.98
\]
\[
r = \frac{-18.3}{4.1 \times 8.98} = -0.497
\]
\[
= -0.497
\]

The correlation coefficient between formal educational level and non-adoption is negative and low. There is no clear relationship between the two variables.

5.1.3 Wealth and operation capital

In adopting any new agricultural innovation, wealth and operational capital to a large extent, have a considerable impact on the eventual decision-making of the farmer. Wealth as an 'economic actor' coupled with rationality, seem to be a major cause of the differences in economic behaviour, among most farmers. The degree to which an innovation is successfully adopted depends on the manner in which the farmer
deploys his wealth or the utilization of the operational capital at his disposal. In the study area the amount of wealth and operational capital was observed to be among the major indicators of economic choice among the respondents. The information collected for this variable included a farmers' aggregate of assets; total annual income from farming; and annual income from other off-farm occupations, if any. The sample contains respondents of various levels of economic rank. One indicator that was used to determine the amount of wealth and therefore operational capital, available to the farmers was their total annual income. On the basis of income respondents were placed on a continuum in an ascending order, from the lowest to the highest. The lowest stratum of respondents consists of farmers with 'very low' annual income that is, those earning less than K£ 250. The next group in the scale consists of those earning more than K£ 250 per annum but less than £500 per annum. Farmers with a total annual income of over K£500 but less than K£750 were considered "average earners". High income earners are those whose annual income exceeds K£750 but less than K£1000 while those who get over K£1000 per annum were labelled "very high" income earners. The data for various groups of income earners are given in table 1 and Figures 6 and 7.
<table>
<thead>
<tr>
<th>INCOME CATEGORY</th>
<th>ADOPTERS</th>
<th>NON-ADOPTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Very low</td>
<td>7</td>
<td>13.7</td>
</tr>
<tr>
<td>Low</td>
<td>17</td>
<td>33.3</td>
</tr>
<tr>
<td>Average</td>
<td>10</td>
<td>19.6</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
<td>4.0</td>
</tr>
<tr>
<td>Very high</td>
<td>15</td>
<td>29.4</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td><strong>51</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 11: Distribution of respondents by annual income.

Figure 6: Distribution of respondents by economic rank for adopters.
Figure 7: Distribution of respondents by economic rank for non-adopters

A comparison of annual income is made between the adopters and non-adopters. This is done by constructing frequency distributions of the actual income figures for every category of income earners for each of the two categories of respondents. These are shown in tables 12 - 16.
### Table 12: Distribution of income for "very low" income earners

<table>
<thead>
<tr>
<th>Annual income in £</th>
<th>No.</th>
<th>Annual income in £</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>4</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>125</td>
<td>1</td>
<td>75</td>
<td>2</td>
</tr>
<tr>
<td>150</td>
<td>1</td>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>200</td>
<td>1</td>
<td>85</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>175</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total:</strong> 875</td>
<td>7</td>
<td><strong>Total 3490</strong></td>
<td>27</td>
</tr>
<tr>
<td><strong>Mean:</strong> 125</td>
<td></td>
<td><strong>Mean: 129.3</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Table 13: Distribution of income for "low income" earners

<table>
<thead>
<tr>
<th>Annual income in £</th>
<th>No.</th>
<th>Annual income in £</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>6</td>
<td>300</td>
<td>2</td>
</tr>
<tr>
<td>300</td>
<td>3</td>
<td>350</td>
<td>1</td>
</tr>
<tr>
<td>350</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total:</strong> 5700</td>
<td>17</td>
<td><strong>Total: 950</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>Mean:</strong> 335.3</td>
<td></td>
<td><strong>Mean: 316.7</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 12: Distribution of income for "very low" income earners.

Table 13: Distribution of income for "low income" earners.
### Table 14: Distribution of income for "average-income" earners

<table>
<thead>
<tr>
<th>ADOPTER</th>
<th>NON-ADOPTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual income in £</td>
<td>No.</td>
</tr>
<tr>
<td>500</td>
<td>6</td>
</tr>
<tr>
<td>550</td>
<td>1</td>
</tr>
<tr>
<td>600</td>
<td>3</td>
</tr>
<tr>
<td>Total: 5350</td>
<td>10</td>
</tr>
<tr>
<td>Mean: 535</td>
<td></td>
</tr>
</tbody>
</table>

### Table 15: Distribution of income for "high-income" earners

<table>
<thead>
<tr>
<th>ADOPTERS</th>
<th>NON-ADOPTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual income in £</td>
<td>No.</td>
</tr>
<tr>
<td>750</td>
<td>1</td>
</tr>
<tr>
<td>800</td>
<td>1</td>
</tr>
<tr>
<td>Total: 1550</td>
<td>2</td>
</tr>
<tr>
<td>Mean: 775</td>
<td></td>
</tr>
<tr>
<td>ADOPTERS</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>Annual income in £</td>
<td>No.</td>
</tr>
<tr>
<td>1000</td>
<td>5</td>
</tr>
<tr>
<td>1350</td>
<td>1</td>
</tr>
<tr>
<td>1500</td>
<td>1</td>
</tr>
<tr>
<td>1750</td>
<td>1</td>
</tr>
<tr>
<td>2100</td>
<td>1</td>
</tr>
<tr>
<td>2500</td>
<td>2</td>
</tr>
<tr>
<td>3050</td>
<td>1</td>
</tr>
<tr>
<td>4250</td>
<td>1</td>
</tr>
<tr>
<td>4500</td>
<td>1</td>
</tr>
<tr>
<td>5500</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total:</strong> 34100</td>
<td>15</td>
</tr>
<tr>
<td><strong>Mean:</strong> 2273.3</td>
<td></td>
</tr>
</tbody>
</table>

Table 16: Distribution of income for "very-high" income earners.

Correlation coefficients between income and adoption; and between income and non-adopter were calculated. The values in the x variable are mean income figures in each category of income but these have been reduced by dividing by 100 as a matter of computation. The fractions that result are ignored. The y variable is represented by the actual number of respondents in each income category (tables 12-16). The working is shown in tables 17 and 18.
Table 17: Calculation of correlation coefficient between income and adoption.

\[ x = \frac{1}{n} \sum x_i = \frac{1}{5} \times 38 = 7.6 \]

\[ y = \frac{1}{n} \sum y_i = \frac{1}{5} \times 51 = 10.2 \]

\[ \text{Cov} = \frac{1}{n} \sum x_i y_i = (\bar{x})(\bar{y}) = (\frac{1}{5} \times 452) - (7.6)(10.2) \]

\[ = 90.4 - 77.52 = 12.88 \]

\[ s_x = \sqrt{\frac{1}{n} \sum x_i^2 - (\bar{x})^2} = \sqrt{\frac{1}{5} \times 568} - (7.6)^2 \]

\[ = \sqrt{113.6} - 57.76 = \sqrt{55.84} = 7.47 \]

\[ s_y = \sqrt{\frac{1}{n} \sum y_i^2 - (\bar{y})^2} = \sqrt{\frac{1}{5} \times 667} - 104.04 \]

\[ = \sqrt{133.3} - 104.04 = \sqrt{29.36} = 5.42 \]
The correlation coefficient between income and adoption is low (weak) and positive.

\[
\begin{align*}
r &= \frac{\text{cov}_{x,y}}{s_{x} s_{y}} = \frac{12.88}{7.47 \times 5.42} = \frac{12.88}{40.49} = 0.318 \\
&= 0.318.
\end{align*}
\]

Table 18. Calculation of correlation coefficient between income and non-adoption.

<table>
<thead>
<tr>
<th>$x_i$</th>
<th>$y_i$</th>
<th>$x_i^2$</th>
<th>$y_i^2$</th>
<th>$x_i y_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27</td>
<td>1</td>
<td>729</td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>25</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>64</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>144</td>
<td>9</td>
<td>36</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
\sum x_i &= 29 \\
\sum y_i &= 39 \\
\sum x_i^2 &= 243 \\
\sum y_i^2 &= 767 \\
\sum x_i y_i &= 108
\end{align*}
\]

\[
\begin{align*}
\bar{x} &= \frac{1}{n} \sum x_i = \frac{1}{5} \times 29 = 5.8 \\
\bar{y} &= \frac{1}{n} \sum y_i = \frac{1}{5} \times 39 = 7.8 \\
\text{Cov} &= \frac{1}{n} \sum x_i y_i - (\bar{x})(\bar{y}) = \left(\frac{1}{5} \times 108\right) - (5.8)(7.8) \\
&= 21.6 - 45.24 = -23.64 \\
\end{align*}
\]

\[
\begin{align*}
\text{s}_x &= \sqrt{\frac{1}{n} \sum x_i^2 - (\bar{x})^2} = \sqrt{\left(\frac{1}{5} \times 243\right) - (5.8)^2} \\
&= \sqrt{48.6 - 33.64} = \sqrt{14.96} = 3.867 \\
&= 3.87
\end{align*}
\]
\[ s_y = \sqrt{\frac{1}{n} \sum y_i^2 - \overline{y}^2} = \left( \frac{1}{5} \times 767 \right) - (7.8)^2 \]
\[ = \sqrt{153.4 - 60.84} = \sqrt{92.56} = 9.620 \]
\[ = 9.62 \]
\[ r = \frac{\text{cov}_{x,y}}{s_x s_y} = \frac{-23.64}{3.87 \times 9.62} = \frac{-23.64}{37.23} = -0.6349 \]
\[ = -0.635 \]

The correlation coefficient between income and non-adoption is negative and high. However it is not a strong negative correlation.

5.1.4 Size of land

On the basis of this variable, all farms in the sample were categorized according to size as follows:

i. all farms measuring less than five acres were labelled 'very small' farms.

ii. farms measuring between five and nine acres inclusive, were considered 'small' farms.

iii. farms ranging from ten acres to fourteen acres were labelled 'fairly large' farms

iv. farms measuring fifteen acres and above were labelled 'large' farms.

Table 19 shows the distribution of farm sizes based on this criterion, for both adopters and non-adopters.
Table 19: Distribution of farms by size.

A comparison of farm sizes between the adopters and non-adopters was made by drawing frequency distribution tables and working out the mean acreage of farms in each category of farms (table 20 and 21).
Table 20: Distribution of individual farms by acreage.

<table>
<thead>
<tr>
<th>ACREAGE</th>
<th>NO.</th>
<th>ACREAGE</th>
<th>NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 21: Comparison of mean acreage of farm between adopters and non-adopters.

<table>
<thead>
<tr>
<th>FARM CATEGORY</th>
<th>MEAN ACREAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADOPTERS</td>
</tr>
<tr>
<td>Very small</td>
<td>2.8</td>
</tr>
<tr>
<td>Small</td>
<td>6.9</td>
</tr>
<tr>
<td>Fairly large</td>
<td>10.5</td>
</tr>
<tr>
<td>Large</td>
<td>21.0</td>
</tr>
<tr>
<td>Mean total</td>
<td>10.3</td>
</tr>
</tbody>
</table>

Correlation coefficients between size of land and adoption; and between size of land and non-adoption are worked out from tables 22 and 23 respectively. The x values are derived from the mean figures for acreage, ignoring the fractions.
(see table 21). The values in the y variable are the actual number of adopters or non-adopters (table 19)

<table>
<thead>
<tr>
<th>$x_i$</th>
<th>$y_i$</th>
<th>$x_i^2$</th>
<th>$y_i^2$</th>
<th>$x_i y_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>13</td>
<td>4</td>
<td>169</td>
<td>26</td>
</tr>
<tr>
<td>6</td>
<td>14</td>
<td>36</td>
<td>196</td>
<td>84</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>21</td>
<td>14</td>
<td>441</td>
<td>196</td>
<td>294</td>
</tr>
</tbody>
</table>

$\Sigma x_i = 39$  $\Sigma y_i = 51$  $\Sigma x_i^2 = 581$  $\Sigma y_i^2 = 661$  $\Sigma x_i y_i = .504$

Table 22: Calculation of correlation coefficient between size of land and adoption.

From table 22,

$\overline{x} = \frac{1}{n} \Sigma x_i = \frac{1}{4} \times 39 = 9.8$

$\overline{y} = \frac{1}{n} \Sigma y_i = \frac{1}{4} \times 51 = 12.8$

$\text{cov} = \frac{1}{n} \Sigma x_i y_i - (\overline{x})(\overline{y}) = (\frac{1}{4} \times 504) - (9.8)(12.8)$

$= 126 - 125.4 = 0.6$

$s_x = \sqrt{\frac{1}{n} \Sigma x_i^2 - (\overline{x})^2} = \sqrt{\frac{1}{4} \times 581} - (9.8)^2$

$= \sqrt{145.25 - 96.04} = \sqrt{49.21} = 7.014 = 7.01$

$s_y = \sqrt{\frac{1}{n} \Sigma y_i^2 - (\overline{y})^2} = \sqrt{\frac{1}{4} \times 661} - (12.8)^2$

$= \sqrt{165.25 - 163.84} = \sqrt{1.41}$

$= 1.19$
The correlation coefficient, between size of land and adoption is positive but very low (weak). Thus no relationship between the two variables can be ascertained.

\[
r = \frac{\text{cov}}{s_x s_y} = \frac{0.6}{7.01 \times 1.19} = \frac{0.6}{8.34} = 0.0719
\]

\[= 0.072\]

Table 23: Calculation of correlation between size of land and non-adoption.

<table>
<thead>
<tr>
<th>(x_i)</th>
<th>(y_i)</th>
<th>(x_i^2)</th>
<th>(y_i^2)</th>
<th>(x_i y_i)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>20</td>
<td>9</td>
<td>400</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
<td>36</td>
<td>256</td>
<td>96</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>100</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
<td>576</td>
<td>4</td>
<td>48</td>
</tr>
</tbody>
</table>

\[
\bar{x} = \frac{1}{n} \Sigma x_i = \frac{1}{4} \times 43 = 10.75 = 10.8
\]

\[
\bar{y} = \frac{1}{n} \Sigma y_i = \frac{1}{4} \times 39 = 9.75 = 9.8
\]

\[
\text{cov} = \frac{1}{n} \Sigma x_i y_i - (\bar{x})(\bar{y}) = \left(\frac{1}{4} \times 214\right) - (10.8)(9.8)
\]

\[= 53.5 - 105.8 = -52.3\]

\[
s_x = \sqrt{\frac{1}{n} \Sigma x_i^2 - (\bar{x})^2} = \sqrt{\left(\frac{1}{4} \times 721\right) - (10.8)} = \sqrt{180.25 - 116.64}
\]

\[= 63.6 = 7.97\]
\[ s_y = \sqrt{\frac{1}{n} \sum y_i^2 - (\bar{y})^2} = \frac{1}{4} \times 661 - (9.8)^2 \]

\[ = \sqrt{165.25 - 96.04} = \sqrt{69.21} = 8.32 \]

\[ r = \frac{\text{cov}}{s_x s_y} = \frac{-53.2}{7.97 \times 8.32} = \frac{-53.2}{66.3} = -0.8024 \]

\[ = -0.802 \]

The correlation coefficient between size of land and non-adoption is highly negative. As one variable increases, the other one decreases and vice-versa. Thus, as the size of land increases, the number of non-adopters decreases, hence most of the non-adopters own small pieces of land.

Having analyzed the socio-economic variables quantitatively, it is now possible to compare and contrast these with data collected from observation. First it was observed that within Lukusia area or Ndivisi Location in general, farmers on the whole range from the youthful age, that is, from about the age of twenty, to the very old ones. This pertains to the general farming mostly dominated by the cultivation of maize and other food crops. However, this is not the case with coffee. What was observed in regard to coffee growing reveals the same, pattern as that for the statistical data obtained about the age of the coffee farming population. It was observed that the majority of farmers who grow coffee are middle-aged and above. It was suggested by the author that a possible reason for a few young farmers
engaging in coffee production was that they do need it because most of them do not have labour resources e.g. dependants who could engage in diversifying their domestic production to meet various needs. For middle-aged and the old farmers, diversification in production was a necessity. They have large numbers of dependants, they need to elevate their economic status through accumulation of wealth. Coffee is preferred by this group because it provides a steady cash income to meet these costs. Most young farmers have greater interest in employment in order to earn direct money.

Investigation about the respondents' formal educational level and that of the Lukusi community generally, revealed that the level of illiteracy within the population is low. Many people could read and write. It was observed that majority of the farmers have attained at least some kind of formal education very few farmers are completely illiterate. However, a few farmers fall in the category of people with high education, that is, post-primary education. Thus there is no sharp contrast between the lower stratum and the upper stratum of the population in terms of educational achievement. Therefore, the Lukusi farming population is characterized by all levels of formal education, with low education as the majority. This pattern applies to both the adopters and the non-adopters. Therefore both data, obtained through observation and those obtained quantitatively tally (tables 7 and 8).
Observation also focussed on respondents' wealth which was used as a measure of the operational capital at their disposal. A farmers' wealth was determined by observing and assessing his or her assets. These comprise land, the number of livestock, property owned by the farmer and off-farm occupations that generate income for the farmer. There exists a very small difference in wealth among the farmers in this area. For example, most farmers hardly own over ten acres of land and it is on these plots where livestock is kept and mixed cropping is carried out. However, it was observed that slightly wealthy farmers were those endowed with large tracts of land and those who involved themselves in other off-farm activities. This means that they are able to diversify their income compared to those who owned small pieces of land and depend solely on the farms for their economic activities. Generally therefore, farmers here are neither too poor nor too rich. This contrasts sharply with the data obtained from the respondents through interviews. The statistical data reveal that majority of the non-adopters are within the low economic group while the adopters are fairly spread in the various economic ranks (Table 11).

The distribution of land was discussed in chapter three. It was noted that the area is characterized by the presence of very many small plots that measure under ten acres. Although some farmers have larger acreage of land, most of it is in fragments. Fragmentation is partly a result of the high population density and the traditional system of land
inheritance. In the latter case farmers subdivided large pieces of land into small plots for their sons. Consequently, individuals holding over twenty acres of land are rare. But the statistical data provide a different picture. They reveal that the majority of the non-adopters own small plots compared to their adopter counterparts. And among the adopters, the distribution of land according to size is fairly spread although the small plots are slightly dominant (Table 19).

5.1.5 Testing of Hypothesis 1

The first hypothesis states: Farmers' positive response to coffee growing is determined by a favourable socio-economic status at inception. What was implied in this hypothesis by definition of variables is that the old-age farmers are likely to respond to coffee growing positively than those in other age categories; that wealthy farmers are likely to respond positively than the poorer ones; that a high formal educational level initiates positive response by farmers than the low educational level; and that farmers with large pieces of land will respond positively than those with small farms.

The analysis provided shows that the distribution of farmers by age takes the same pattern for both adopters and non-adopters. Both categories contain a very small proportion of young farmers (3.3 percent in each case). The distribution of middle-age farmers gives the same impression for both
adopters and non-adopters (24.5 percent and 22.2 percent respectively). However majority of the adopters are old-age farmers (28.9 percent) while the old-age farmers do not form a majority of the non-adopters. Generally the majority of respondents are middle-age and above in both cases (Table 2, 3 and 4). This is an indication that there is no specific age that determines a farmers response to the adoption of coffee cultivation, whether positive or negative response.

There are further indicators of this similarity between the adopters and the non-adopters. The mean age for young respondents in both cases is 32 years, the range is 5 years for adopters and 4 years for non-adopters; the variance for adopters is 5.7 and that for the non-adopters is 3; and the standard deviation for adopters is 2 and that for the non-adopters is 1.73. As for middle-age, the mean age for adopters is 48 years and that for non-adopters is 49 years; the range is 17 years in both cases; the variance is 27.68 for adopters and 28.25 for non adopters; and the standard deviation is 5.3 in both cases. The mean age for old-age adopters is 70 years with a range of 28 years. The mean age for old-age non-adopters is 62 years with a range of 14 years. Thus the distribution of old-age non-adopters is more consistent than that of the old-age adopters. This attribute causes difference observed in the variances and standard deviations. The variance for old-age adopters is 74.69 with a standard deviation of 8.76. The variance for old-age non-adopters is 15.19 with a standard deviation of 3.9.
The correlation coefficient between age and non-adoption is positive and strong \((r = 0.8)\). Likewise the correlation coefficient between age and adoption is positive and strong \((r = 0.5)\). Thus an increase in one variable causes an increase in the other variable in both cases. It is therefore, argued here that age has no effect in determining the response farmers give to the innovation.

It is observed that the majority of the respondents are characterized by low formal education. In both cases of adopters and non-adopters, the proportion of respondents with a high formal educational level is very minimal (Tables 7 and 8). The correlation coefficients between formal educational level and adoption; and formal educational level and non-adoption, are both low and negative \((r = 0.252\) and \(r = 0.497\) respectively). This is an indication that there are no clear relationships between the two variables in each case. It thus suggests that farmers' formal educational levels do not determine their response to the innovation under review.

The majority of the respondents cannot be described as being very wealthy; the low-income group from a majority. However, the greatest proportion of low-income earners is seen among the non-adopters (69.2 percent) compared to the adopters (13.7 percent). The distribution of respondents in all levels of income earnings for both the adopters and the non-adopters is an indication that differences in wealth
and operational capital would not solely determine the farmers' response to adopting coffee cultivation (Table 11, Figures 6 and 7).

The mean income earnings in various levels of economic rank were compared between adopters and non-adopters. There are no distinct differences between the two categories of respondents except for the very high income earners (Tables 12 - 16). The correlation coefficient between income and adoption is positive but low ($\gamma = 0.318$), hence there is no clear relationship between the two variables - an increase in one does not necessarily lead to an increase in the other; neither does a decrease in one variable lead to a decrease in the other. The correlation coefficient between income and non-adoption is negative and high ($\gamma = -0.635$) - an increase or decrease in one variable might lead to an increase or decrease in the other variable. However the strength of this relationship is not one-to-one (perfect).

The distribution of land by size in relation to respondents is represented by Table 19. As can be seen the population is dominated by ownership of small farms. This is more so for the non-adopters. As for the adopters, the distribution of farms in various categories of size is well spread with no category dominating. However, the fact that respondents are distributed in all categories for both adopters and non-adopters, suggests that differences in farm size do not solely determine a farmers' response to adopting
coffee cultivation. Differences could be attributed to other factors. The mean acreages of various farm sizes were compared between the adopters and non-adopters. These show that the differences are very minimal. The patterns for adopters and non-adopters take the same trend (Table 21).

The correlation coefficient between land size and adoption and that between land size and non-adoption give sharp contrasts. The one between land size and adoption is very low and positive ($\gamma = 0.072$) suggesting no clear relationship between the two variables. The other, between land size and non-adoption is very high and negative ($\gamma = -0.802$) suggesting that an increase in one causes an increase in the other variable. This anomaly, however, could be explained in terms of errors made in sampling. The sample for the non-adopters is very small compared to that for the adopters. An increase in sample size would probably eradicate the error.

The foregoing discussion on the socio-economic status of the respondents as revealed by both statistical and qualitative data makes it obvious that age does not determine farmers' response to adopt the cultivation of coffee; formal educational level is not a determinant to farmers' response to coffee cultivation; and wealth and operational capital do not cause a differential response to coffee cultivation by farmers. It also shows that the size of land owned by farmers, plays no significant role in determining their response to the adoption of coffee farming. The first hypothesis is therefore proved false, hence it is rejected.
5.2 SITUATIONAL DETERMINANTS OF DIFFERENTIAL RESPONSE

The variables measured under this heading include, the availability of farm production inputs, the cost of farm production inputs; produce prices, the distance between input markets and the farm; availability of labour; and availability of credit facilities.

5.2.1 Availability of Farm Production Inputs

It was assumed that an agricultural innovation is diffused widely and faster if the farm production inputs are easily available to farmers. This depends on the ease with which the supplying centres are accessible to farmers; the amount of inputs; the time the inputs are available; and the farmers' purchasing power which is wholly determined by the amount of operational capital at their disposal. It was assumed that a combination of these factors would ensure the availability of production inputs to the farmer.

The main farm production inputs for coffee that were considered are spray chemicals (pesticides) and fertilizers. Coffee fertilizers that are commonly used in the area are chemical fertilizers, e.g. Calcium Ammonium Nitrate (C.A.N.) which have to be purchased, and natural fertilizers, e.g. farm yard manure. Chemical fertilizers, commonly available in Lukusí area are expensive and are rarely used by the bulk of the population in the area. Farm yard manure is mostly available on the farms. It is prepared by the farmers themselves on their farms but this depends on the availability of animals.
on the farm since it is prepared from cowdung. Green manure and composite manure are often used to supplement farmyard manure.

On the basis of the foregoing, response given by the farmers with regard to the availability of farm production inputs were put into three classes of, easily available; available through difficulties; and not available. For each response the actual number of respondents and percentage figures were computed for both adopters and non-adopters (Table 24).

<table>
<thead>
<tr>
<th>Availability of inputs</th>
<th>ADOPTERS</th>
<th></th>
<th>NON-ADOPTERS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Easily available</td>
<td>19</td>
<td>37.25</td>
<td>12</td>
<td>30.77</td>
</tr>
<tr>
<td>Available through difficulties</td>
<td>32</td>
<td>62.75</td>
<td>12</td>
<td>30.77</td>
</tr>
<tr>
<td>Not available</td>
<td>0</td>
<td>0.00</td>
<td>15</td>
<td>38.46</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>100</td>
<td>39</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 24: Availability of purchased farm production inputs.

The data in table 25 summarizes information on the availability of farm yard manure to the respondents.
<table>
<thead>
<tr>
<th></th>
<th>ADOPTERS</th>
<th></th>
<th>NON-ADOPTERS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm yard manure</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Available</td>
<td>37</td>
<td>72.55</td>
<td>30</td>
<td>76.92</td>
</tr>
<tr>
<td>Not available</td>
<td>14</td>
<td>27.45</td>
<td>9</td>
<td>23.08</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>51</strong></td>
<td><strong>100</strong></td>
<td><strong>39</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 25: Availability of farm yard manure.

5.2.2 Cost of farm production inputs

Availability of farm production inputs alone may not be a sufficient condition for the adoption of coffee production in Lukusi area. The cost, that is, the price of the inputs plays a significant role in determining the availability and amount of farm production inputs to the farmers.

For this variable, respondents were asked what they felt about the costs of inputs in respect of coffee production. Their attitudes towards the cost of inputs were ranked on an ordinal scale as follows:

(1) Low
(2) Fair
(3) High
(4) Very high
The actual numbers and percentage figures for respondents in each category were recorded and tabulated (Table 26). The pattern of the responses is shown in figures 8 and 9.

<table>
<thead>
<tr>
<th>Cost of inputs</th>
<th>ADOPTERS</th>
<th>NON-ADOPTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Low</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Fair</td>
<td>13</td>
<td>25.5</td>
</tr>
<tr>
<td>High</td>
<td>16</td>
<td>31.4</td>
</tr>
<tr>
<td>Very high</td>
<td>22</td>
<td>43.1</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 26. Farmers' perception of the cost of farm production inputs.

Figure 8: Farmers' perception of the cost of inputs (adopters)
5.2.3 Produce prices

Market price for the produce could become a determinant of the rate at which the innovation spreads. A new commodity is likely to spread faster if the prices are conducive. This is in relation to input in terms of financial expenditure, physical energy exerted and time commitment, in the actual production of the commodity.

Considering produce price as a variable affecting differential response to coffee production, respondents were asked to give their views about the current prices for the commodity in relation to their production strategies. Various responses were given but all were categorized as follows:
(1) prices are low
(2) prices are fair
(3) prices are high (good)

The actual numbers and percentage figures for the respondents in each category are given in table 27 and the pattern of the trend is shown in figures 10 and 11.

<table>
<thead>
<tr>
<th>Produce</th>
<th>ADOPTERS</th>
<th>NON-ADOPTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Low</td>
<td>15</td>
<td>29.4</td>
</tr>
<tr>
<td>Fair</td>
<td>9</td>
<td>17.6</td>
</tr>
<tr>
<td>Good</td>
<td>27</td>
<td>53.0</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 27: Perception of coffee prices

5.2.4 Distance Between Input Markets and the Farm

It was assumed that distance between input market and the farm acts either as an incentive or a disincentive to the adoption of the innovation. The central aspect is transportation or rather communication, that is, the accessibility of farmers to input markets. The distance to input markets determines the means and ability of farmers to deliver production inputs to their farms, which in turn influences their decision making about adopting the
Fig. 10: Farmers' Perception of coffee prices (adopters)

Fig. 11: Farmers' Perception of coffee prices (non-adopters).
innovation. This is viewed in terms of the general difficulties
and hardships that may be involved or lack of such hardships.
Thus the location of one's farm in relation to input market
centres will determine whether transportation problems do
exist or not as dictated by the various modes of transport
at the farmers' disposal.

To categorize the respondents, a nominal scale was
used. They were classified into:

(a) those who experience problems
(b) those who do not experience problems (partially
available).

The actual numbers and percentage figures for respondents
are shown in table 28.

<table>
<thead>
<tr>
<th>Distance from input markets</th>
<th>ADOPTERS</th>
<th>NON-ADOPTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problems are experienced</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>39.2</td>
<td>25.6</td>
</tr>
<tr>
<td>Problems are not experienced</td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>60.8</td>
<td>74.4</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 28: Farmers' Perception of the Distance Between Input
Markets and the Farms.
5.2.5 Availability of Labour

Availability of labour is one of the most important factors that influence agricultural production. A crop like coffee is among those crops that demand readily available labour spread throughout the year for it requires attention constantly. It is likely that before a farmer makes any decision to adopt the crop, he or she should be in a position that can avail sufficient labour.

For this variable, the most important aspect was whether labour was easily available or not because the extent of its availability varies from one individual to another. Respondents were grouped into three classes:

(a) labour not available
(b) labour easily available
(c) labour available but through constraints, that is partially available.

The distribution of respondents on the basis of this categorization is given in table 29.
Availability of labour, whether adequate or not, is not an end in itself. It becomes necessary to find out the kind of labour force at the farmers' disposal, that is, the main source of labour. On the basis of this, three sources of labour were identified:

(a) family labour  
(b) hired labour  
(c) family and hired labour combined.

The distribution of respondents based on this criterion is given in Table 30.

<table>
<thead>
<tr>
<th>Labour</th>
<th>ADOPTERS</th>
<th></th>
<th></th>
<th></th>
<th>NON-ADOPTERS</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td></td>
<td>No.</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Not available</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td></td>
<td>0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Easily available</td>
<td>25</td>
<td>49.0</td>
<td>9</td>
<td>23.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially available</td>
<td>26</td>
<td>51.0</td>
<td>30</td>
<td>76.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>51</strong></td>
<td><strong>100</strong></td>
<td><strong>39</strong></td>
<td><strong>100</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 29: Distribution of Farmers on the Basis of Labour Availability.
### Table 30: Distribution of Respondents on the Basis of the Availability of Labour Force.

<table>
<thead>
<tr>
<th>Labour force</th>
<th>ADOPTERS</th>
<th>NON-ADOPTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Family</td>
<td>36</td>
<td>70.6</td>
</tr>
<tr>
<td>Hired</td>
<td>1</td>
<td>1.9</td>
</tr>
<tr>
<td>Combined</td>
<td>14</td>
<td>27.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>51</td>
<td>100</td>
</tr>
</tbody>
</table>

5.2.6 Availability of Credit Facilities

Availability of credit facilities is an important dimension as far as farming is concerned. Credit not only enables one to acquire the necessary operational capital but also enhances his general advancement and progress in farming business. This is more important especially for a cash crop which can repay itself after harvest and marketing.

Farmers in Lukusi area have various options for obtaining credit. The largest source of credit is the Agricultural Finance Corporation with its branch at the District Headquarters and a subbranch at Kimilili. Some farmers obtain credit from commercial banks and from cooperative societies of various kinds. Exclusively for the coffee growers, the Lukusi coffee farmers' cooperative society is
within easy reach. For various reasons, some farmers were identified to have no sources of credit.

For this variable, respondents were categorized on the basis of a nominal scale variable as those accessible to sources of credit and those without such accessibility (Table 31).

<table>
<thead>
<tr>
<th>Credit facilities</th>
<th>ADOPTERS</th>
<th></th>
<th>NON-ADOPTERS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Available</td>
<td>32</td>
<td>62.7</td>
<td>7</td>
<td>17.9</td>
</tr>
<tr>
<td>Not available</td>
<td>19</td>
<td>37.3</td>
<td>32</td>
<td>82.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>51</td>
<td>100</td>
<td>39</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 31: Distribution of Respondents on the Basis of the Availability of Credit Facilities.
Having analysed the data statistically, now follows the qualitative analysis based on participant observed impressions. First it was observed that Lukusi area is well within an active agricultural zone. The area is served by a fairly large market centre (Lukusi). Additionally there are two urban centres, Webuye and Kimilili. These centres have all the farm production inputs needed by farmers. The major suppliers of farm production inputs are the Kenya Grain Growers' Cooperative Union (K.G.G.C.U) with its branches at Webuye, and Kimilili; and the Agricultural Finance Corporation (A.F.C) with its sub-branch at Kimilili. The coffee pulping factory also stocks some.

The inputs, largely fertilizers, are either purchased on cash terms or are granted in the form of seasonal loan to deserving farmers. There are also business firms that sell inputs directly to the farmers. Production inputs are also stocked in shops at market centres close to the farmers.

Thus farmers within Lukusi have all kinds of production inputs available to them. There has never been any lack of them. What has been experienced is a delay on the part of sellers in stocking and distributing. This is more so with respect to the imported chemical fertilizers, a matter that has been affecting the whole country. Farm yard/composite manure is very much preferred by the bulk of coffee farmers as well as the non-coffee growers because
it is easily available for "free" within their compounds as most of them are mixed farmers. The livestock they keep yield dung which provides manure. Therefore, production inputs are well available to the farmers, both the adopters of coffee and the non-adopters.

The cost of farm production inputs was definitely an inhibiting rather than a motivating factor to the farmers in their efforts to improve, increase or even to diversify their production activities. It is almost the deciding factor for one's progress or retardation in farming business. It was observed that the majority of farmers in the area were not in favour of the prices they were being charged for the merchandize they needed. There was a general outcry about the exhorbitant fertilizer prices. Many farmers complained about the year to year hiking of fertilizer prices; consequently the poor farmers end up not purchasing them, instead they turn to manure as the only alternative. The researcher's impression is that the majority of the respondents are not in favour of the costs of production inputs.

Produce prices for coffee were reported as having a sharp contrast to the cost of production inputs. It was claimed by farmers that while the costs on production inputs were excessively high, the net returns from the produce were staggeringly low. This implies that if the trend remains constant, then most farmers are likely to disengage themselves from such "unpaying" activities. This seems to be a major reason why some farmers neglected or abandoned
the production of certain crops, including coffee, after an initial period of active involvement in them. It was observed that farmers were quite dissatisfied with the way coffee prices varied from region to region in the country. They cited Mount Elgon, Kisii District and central Kenya as regions where coffee commanded high prices compared to what they (the Lukusi farmers) produced. However, it was observed at the coffee factory during payments to farmers that, the crop is usually graded and the prices are determined by the quality (grade) of the produce. Hence the higher the quality of the crop the higher the prices, and the lower the quality, the low the prices. Following these observations this variable contrasts sharply to that presented in statistical terms. The statistics show that majority of the respondents were in favour of the current produce prices for coffee (Table 27 and Figures 10 and 11). It is suggested that the frequent fluctuations in coffee prices has an influence on this state of affairs.

The distances between input markets and the farms are fairly close to the farmers. These include both local market places and the two urban centres, that is, Webuye and Kimilili. Production inputs are also available at the coffee factory within Lukusi. The whole area is linked to the nearby urban centres by a good network of roads with a reasonably fair traffic flow of vehicles. Inputs are delivered to the farms by a variety of means—vehicles, bicycles, ox carts, sledges, and human potterage. The choice of any mode of transportation depended on the distance to be covered, the quality of inputs and the financial position of the farmer.
More affluent farmers who used large quantities of inputs preferred using vehicles, while the less affluent who need inputs in less quantities use cheaper means such as an animal sledge.

Farmyard manure is readily available on most farms, hence the need for transportation costs does not arise. Both qualitative and quantitative data tally on this issue therefore, the distance between production input markets and the farm does not determine or is not of major importance in determining farmers' response to coffee production.

Coffee production, like any other agricultural activity, requires sufficient labour. The labour demands for coffee include planting, weeding, mulching and fertilizer application (top-dressing), as well as chemical spraying and pruning, and finally harvesting. Some crops like maize and sugar cane within Lukusi area required intensive and often enormous labour force at 'peak' seasons e.g. during planting, weeding and harvesting. In between these intervals, there is no labour required. These crops, when grown for commercial purposes, tend to occupy a relatively large piece of land compared to coffee. Coffee had no 'peak' seasons of work. Rather, the labour is spread throughout the year and is light apart from harvesting which requires a large labour force to speed up the work depending on the area covered by the crop. A delay in picking the ripe berries spoils their quality.
Two sources of labour were predominant in the coffee industry that is, family labour and hired labour. The former is common while the latter is rare in the area under study. Sometimes farmers combined the two forms of labour. The availability of labour was determined by the size of the family and the economic status of the farmer. In some instances a man, his wife and children or relatives worked in their farms. Hired labour is characteristic of the more affluent farmers who have enough cash to pay workers. There is also cooperative or exchange labour whereby a number of families combine forces and work in their farms rotatively, particularly at peak seasons e.g. weeding and harvesting. It thus follows that neither the adopters of coffee nor the non-adopters lack the necessary labour required for production. In the study, both statistical and observed practices yielded similar information.

The availability of credit facilities to a farming community is also likely to be a major indicator in their response to an agricultural innovation. Credit is important especially when a farmer lacks the operational capital to initiatively invest in farming. Lukusi area is within easy reach sources of credit. The adopters of coffee are quite conversant with the need for, and the procedures to obtain credit from various sources as indicated earlier. The majority of the farmers, however, did not have any access to, or utilized sources of credit. Among these, despite their interest in obtaining credit, did not have any idea about the procedures to obtain credit. In another instance, farmers claimed that they could or rather would not go in for loans
because they were poor. They believed that credit facilities are only available to the rich or the well-off farmers. Some farmers have refrained from acquiring loans because they once received credit but incurred heavy losses to the extent of being unable to repay, hence parts of their plots were auctioned to offset the debt. Some farmers feel that they should not go in for loans because the interest rates are very high. This appears to be the reason why some members of the coffee growers' cooperative society did not want to utilize the credit facilities offered by the society.

However, it was noticed that some farmers never use these credit facilities as required or recommended by their creditors. The loans are not used in farming, instead they are converted into other forms of investment e.g. trading activities. This is more so especially if the loans are given in the form of money instead of materials. Sometimes when loans are granted in the form of materials, farmers sell them for cash money thereby diverting the money to other businesses. Progressive farmers were identified as those who made maximum use of credit facilities by investing as recommended by their creditors, hence incurred no losses but gained more.

The statistical data and field participant observations confirm that most farmers do not have access to credit facilities, particularly non-adopters of coffee. As for the adopters, many of them have access to credit facilities (Table 31).
5.2.7 **Testing of Hypothesis 2.**

This hypothesis states: Farmers' negative response to coffee production is not influenced by the situational factors.

By definition of variables situational factors included the availability of farm production inputs; the availability of credit facilities; the cost of production inputs; produce prices; the distance between input markets and the farms; and the availability of a large labour force.

The data reveal that farm production inputs are available to both the adopters and the non-adopters, but in varying degrees. This is with regard to purchased production inputs. As for the non-adopter respondents, a large proportion of them have access to farm production inputs (61.54 percent) while those completely unable to have access to production inputs account for a small proportion (38.46 percent). None of the adopters completely lacks inputs (Table 24). Both the adopters and the non-adopters who have access to the non-purchased farm production inputs (that is, farmyard manure) form a large proportion of the respondents (Table 25). Therefore the availability or unavailability of farm production inputs does not account for the differential response by farmers to coffee production. In other words, the negative response by some respondents cannot be accounted for by the unavailability of farm production inputs.
As for the cost of farm production inputs, the data reveal that a large proportion of the respondents, adopters and non-adopters, are not in favour of the cost of inputs. Both the adopters and the non-adopters share the same characteristics in this respect. Consequently a differential response to coffee production cannot be accounted for by the high prices of production inputs. This factor cannot explain why some respondents responded negatively to the crop since such costs also affect the adopters. It is also revealed by the quantitative data that the majority of the respondents, both adopters and the non-adopters are in favour of the produce prices for coffee.

However qualitative data indicate that most of the farmers were not in favour of the produce prices for coffee. It has been suggested that this latter view can be associated to frequent fluctuations in coffee prices. If many adopters and non-adopters and non-adopters are in favour of the produce prices in one situation and at the same time they don't favour the produce prices in another situation, then it follows that the prices for the produce have little effect in determining adoption or non-adoption of the crop. Alternatively it may reflect a true picture of the situation considering that written questionnaire answers sometimes can be falfsefied. And on the contrary, qualitative data are often elicited in a more relaxed situation. In addition the observation and participation approach provides individual's inner feelings. Despite the complaints of unfavourable prices
for the crop, farmers who seriously cultivate coffee are generally relatively better off than others.

The data for both adopters and non-adopters show that a large proportion of the respondents falls under those who do not experience any problems with respect to the distance between input markets and the farms. This is in agreement with the situation as it was actually observed; farmers in the study area are within input market centres. Distance, therefore, does not affect the response farmers give to coffee production.

All respondents admitted that the necessary labour required for coffee production is at least available although sometimes it is below their requirements. In small-scale coffee production, a large labourforce is not necessary. The greatest source of labour is the farmer's family itself, supplemented by other sources.

The availability of credit facilities among coffee adopters is positive to many of them (62.7 percent) while those who do not have access are as small a proportion as 37.3 percent. For the non-adopters 82.1% have no access to credit facilities (Table 31). It is suggested therefore that some farmers have negatively responded to coffee production because they lack credit facilities. But the situation is rather complicated because some adopters of the crop also lack credit facilities while at the same time some non-adopters have access to credit facilities. It was established that credit facilities are offered to farmers by their cooperative society upon becoming members to it.
But probably most significant is the fact that most of the farmers are small-scale and therefore do not need enormous capital outlay. Furthermore they use their own labour as capital. It is thus argued here that the availability or unavailability of credit facilities do not affect the response farmers give to coffee production. Lack of credit facilities cannot account for the non-adoption of coffee by farmers.

All the findings on the different situational variables as revealed by the data support the hypothesis as suggested.
5.3.0 CHANGE AGENTS

Change agents include the availability of agricultural extension agents; farmers' social participation in formal organizations; the use of mass media; and contacts with neighbours who have adopted new innovation or heard and know something about them.

The diffusion of an innovation, its adoption and spread takes place in a social system where individuals interact amongst themselves. This happens faster if the "interaction effect" is high. According to Vail (1972:53), a novel farming practice is made available to farmers by change agents. The change agents may be members of the farmers' own community or, they may be outsiders such as merchants or government representatives. The speed with which a new practice is adopted by local farmers depends upon both the terms on which it is made available, and its "fit" with the resources, abilities and preferences of the farming community.

The term change agent is a characterization of individuals or institutions which, willfully or through planned organizational strategies, perform specific kinds of functions to stimulate change, in this case, in agricultural practices.

5.3.1 Availability of Agricultural Extension Services

The agricultural extension agency of the Ministry of Agriculture is known to perform various functions to farmers. These include communication of recommendations; bringing alternative methods to farmers; teaching manual skills and managerial strategies; and to convey the
expected results of new practices. Dissemination of new ideas, skills and techniques to farmers is accompanied by reinforcement of the existing ones which prove to be equally important. This needs thorough propagation and is determined by the frequency with which extension agents interact with the farmers.

In Lukusi area, sources of agricultural extension include agricultural extension workers from the Ministry of Agriculture and community development agents from within Ndivisi Location. The coffee cooperative society based at the Lukusi coffee factory also maintains a team of specialists who provide extension service to coffee farmers.

Through interviews, respondents were grouped according to their frequency of contact with extension agents over a certain period of time e.g. in a week, month or year. On the basis of this criterion, respondents were classified into those with no contacts with extension agents; those with occasional contacts; and those with frequent contacts. This information is condensed in Table 32.

The figures in Table 32 show that much of the extension service is directed more to the adopters than to the non-adopters. It was established that in Lukusi area, the provision of agricultural extension services has not been consistent. Rather the extension agents arrange for a meeting or a field demonstration by invitation of a leading farmer in whose plot other farmers attend at their will. This usually happens occasionally hence there is no door-to-door
campaign by extension agents to bring farmers to an awareness of the need to improve their techniques or to receive new ideas. Therefore extension services in this area are less effective, and a claim that extension attention is greatly skewed in favour of the more progressive and wealthier farmers, finds support (Leonard, 1972:4).

<table>
<thead>
<tr>
<th>Contacts with extensionists</th>
<th>ADOPTERS</th>
<th></th>
<th>NON-ADOPTERS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No contacts</td>
<td>15</td>
<td>29.4</td>
<td>25</td>
<td>64.1</td>
</tr>
<tr>
<td>Occasional contacts</td>
<td>18</td>
<td>35.3</td>
<td>13</td>
<td>33.3</td>
</tr>
<tr>
<td>Frequent contacts</td>
<td>18</td>
<td>35.3</td>
<td>1</td>
<td>2.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>51</td>
<td>100</td>
<td>39</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 32: Distribution of Respondents by Contacts with Extension Agents.

5.3.2 Social Participation in Formal Organizations

Formal organizations were viewed as formally organized institutions that create an educational impact on the farmers. It was found that farmers who took an active involvement in any agricultural organization tended to be more informed of the importance of innovativeness than those without any initiative to participate. Farmers were found taking part in various organizations such as agricultural shows, farmers training centres, attendance at farmers' seminars, membership
to cooperative unions or societies and participation in field demonstrations.

Membership to cooperative societies; participation in field demonstrations; and attendance at agricultural shows, were used as indices, for social participation in formal organizations. In the sample, respondents were found to participate in at least one or more of these organizations. Respondents' involvement was reckoned on the fact as to whether they were officials or just ordinary members. The actual numbers and percentage figures for the distribution of respondents are shown in Tables 33 and 34 for adopters and non-adopters respectively.

<table>
<thead>
<tr>
<th>ORGANIZATION</th>
<th>CS</th>
<th>FD</th>
<th>AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTICIPATION</td>
<td>NO.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>YES</td>
<td>51</td>
<td>100</td>
<td>42</td>
</tr>
<tr>
<td>NO</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>TOTAL</td>
<td>51</td>
<td>100</td>
<td>51</td>
</tr>
</tbody>
</table>

Key: CS = Cooperative Societies; FD=Field Demonstrations
AS = Agricultural Shows.

Table 33: Farmers' participation in Formal Organizations (adopters)
### Table 34: Farmers' participation in Formal Organizations (non-adopters).

<table>
<thead>
<tr>
<th>ORGANIZATION</th>
<th>CS</th>
<th>FD</th>
<th>AS</th>
</tr>
</thead>
</table>
|              | NO. % | NO.  | No.  |%
| YES          | 1 2.6 | 24 61.5 | 3 7.7 |
| NO           | 38 97.4 | 15 38.5 | 36 92.3 |
| TOTAL        | 39 100 | 39 100 | 39 100 |

Key: CS = Cooperative Societies; FD = Field Demonstrations; AS = Agricultural shows.

5.3.3 Use of Mass Media.

For this variable respondents' possession or non-possession of radios, magazines or newspapers or televisions were investigated. Of supreme importance was how farmers gained by use of these media. Hence respondents were asked to identify the programmes or sections that were of benefit and educational value to them as far as farming business was concerned. None of the respondents possessed a television set. Mass media information was restricted to the use of radio and newspapers or magazines. Tables 35 and 36 show the distribution of respondents based on this variable.
<table>
<thead>
<tr>
<th>Use of Mass Media</th>
<th>RADIO</th>
<th>Newspaper/Magazine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO.</td>
<td>%</td>
</tr>
<tr>
<td>YES</td>
<td>31</td>
<td>60.8</td>
</tr>
<tr>
<td>NO</td>
<td>20</td>
<td>39.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>51</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 35: Distribution of Respondents by use of Mass Media (adopters)

<table>
<thead>
<tr>
<th>Use of Mass Media</th>
<th>RADIO</th>
<th>Newspaper/Magazine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>YES</td>
<td>17</td>
<td>43.6</td>
</tr>
<tr>
<td>NO</td>
<td>22</td>
<td>56.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>39</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 36: Distribution of Respondents by Use of Mass Media (non-adopters).
5.3.4 Contacts with Neighbours

The extent to which an individual adopts an innovation as an influence to contacts with neighbours proved difficult to ascertain. A community is made up of a social system in which individuals are interacting from time to time and for various purposes. Contacts between neighbours is a necessity for humans since there is always interdependence among them. Contacts between neighbours is a variable that was used to observe the impact it has on both the adopters of coffee and the non-adopters.

For this variable, contacts amongst farmers were observed in three types, namely contacts between neighbours because they are relatives (kinship relations); contacts between neighbours because of the general spirit of neighbourlihood and contacts between neighbours made on the basis of agricultural business i.e sharing of ideas and activities pertaining to farming.

Contacts between neighbours can affect the rate at which an innovation spreads, where interacting individuals have common interests. Table 37 shows the distribution of respondents according to this criterion.
Table 37: Distribution of Respondents by Type of Contact with Neighbours.

5.3.5 Testing of Hypothesis 3

This hypothesis states: Farmers' positive response to coffee growing in Ndivisi Location is determined by their degree or level of contact with change agents. By definition of variables adoption or positive response is a result of greater contacts with agricultural extension agents; social participation in formal organizations; use of mass media; and greater contacts with neighbours.

The study shows that a greater part of the non-adopters have no contacts with extension agents while a greater part of adopters do. Therefore, extension service, to a large extent influences adoption. The majority of farmers participate in field demonstrations, that is, 82.4 percent of adopters and 61.5 percent of non-adopters are involved in field demonstrations (Tables 33 and 34). All adopters participate in cooperative societies while only one
A non-adopter was found to participate. For both adopters and non-adopters, the proportion of participants in agricultural shows is very small. By comparison the average percentage of all participants is greater for adopters but very small for non-adopters (66.03 percent and 23.93 percent respectively). The majority of non-participants are non-adopters (76.07 percent). To a certain extent, social participation in formal organizations influences adoption of an innovation while non-participation tends to promote negative response.

The data also reveal that the majority of the adopters make use of mass media facilities while the majority of the non-adopters do not. However, the differences between the users and non-users of mass media facilities in both cases are not extreme. On average 57.85 percent of the adopters use mass media facilities in getting new farming ideas, while the rest do not. Among the non-adopters 34.6 percent utilize mass media facilities, while the rest do not. To a certain extent, the access to and utilization of mass media facilities promotes adoption of an innovation but to a certain extent it does not since a reasonable proportion of the non-adopters are also exposed to the use of mass media (Table 35 and 36).

Contacts between neighbours do not reveal anything as far as adoption and non-adoption of coffee is concerned; the observed contacts are dominated by kinship relations and neighbourhood. And for that matter, contacts for purposes of farming are minimal.
On the basis of these findings, the hypothesis is partly accepted and partly rejected, that is, extension service and farmers' social participation in formal organizations determine farmers' positive response to the adoption of coffee farming as an innovation; use of mass media facilities is partly influential. On the contrary contacts among neighbours do not facilitate fora for acquisition or dissemination of new agricultural ideas such as the adoption of coffee farming.
CHAPTER 6

CONCLUSIONS AND SUGGESTIONS

The purpose of this section is to present results in the form of general conclusions as revealed by the findings; to evaluate farmers' response to the adoption of coffee farming as an agricultural innovation; and to present suggestions that, might attract farmers to adopt new agricultural innovations especially in respect to coffee farming.

6.1 Conclusions

This study has shown that neither farmers' age nor their level of formal education are necessary determinants of their response to adopt coffee production. In other words, farmers do not have to attain a certain age or formal educational level in order to adopt coffee as a novel farming practice. Small-scale coffee farmers do not need to have a substantial amount of wealth and operational capital as a necessary condition to take up coffee farming. Similarly the size of land owned by farmers is insignificant in determining their differential response to coffee production. By and large the negative response to coffee production by some farmers has not been caused by the unavailability of farm production inputs; cost of farm production inputs; lack of labour; The distance between input markets and the farms; produce prices; and lack of credit facilities. But inadequate and in appropriate agricultural extension services have a diverse effect
on farmers' adoption of coffee farming. The social participation by farmers in formal organizations has a great impact in influencing them to adopt coffee production. Farmers who participate in activities organized by formal organizations form the majority of adopters of coffee farming. It is observed also that access to and use of mass media facilities for acquisition and dissemination of innovative information have great and positive impact on farmers leading them to go into coffee farming. But on the contrary, contacts amongst neighbours have little impact on farmers' response to coffee farming.

6.2 Evaluation of Farmers' Response

The respondents gave various reasons for their positive and negative responses to the adoption of coffee farming as an economic activity. Among the adopters, their positive response is a result of their interest in coffee as an agricultural product that supplemented other crops and facilitated diversification in their farm activities. It is a strategy that provides security against risks; the need to obtain a steady and continuous cash income for solving emergent problems and necessities e.g. payment of school fees; purchase of consumer goods, durable goods, cattle, acquisition of capital assets and to meet recurrent agricultural expenditure.

In the pre-independence period, coffee was mostly grown by white settlers. After independence, this franchise was extended to the Africans. Many farmers who adopted it
earlier did so as a measure of demonstrating that they could or had undergone an upward social and economic mobility. It became prestigious to grow coffee, hence coffee growers were regarded as progressive farmers, like white settlers or who have taken over from them. But coffee was also adopted because of its many and relative advantages. When well carried out coffee farming can be economically very rewarding. And, because coffee is a perennial crop lasting over one hundred years, it a form of permanent investment that can benefit many generations through inheritance. In cases where farmers had no title deeds, for their land, coffee planting legitimised ownership of land.

Coffee does not need an initial large capital outlay or a large piece of land to yield a relatively adequate subsistent crop compared to crops such as rice, maize and sugar cane. Coffee does not require a deployment of a massive labour force as in the case of sugarcane and maize which also are grown in this area; land under the former crop is not extensive. Marketing of the crop is certain and streamlined through a cooperative society. Some farmers took to coffee farming after seeing others in neighbouring areas grow affluent e.g. during the coffee boom of the 1950s in Chwele Location. It sparked off increased rate of adoption of the crop in the area of study. The latter adopters were encouraged by the success achieved by the earlier adopters.
The adoption of coffee is in response to government call to increase cash crop production. Coffee is one of the major earners of foreign exchange in Kenya; its cultivation is a contribution to national development. It can also be suggested that coffee is a relatively easy crop to grow and does not require the use of expensive or complex machinery in terms of land preparation and harvesting. As an innovation, it is relatively easy to understand and use. Further, the crop can be tried on a limited basis for experimental purposes to predict its success or failure. And, when this done under intercropping circumstances, it minimises risks. Land under coffee can easily be restored or reverted to accommodate other crops when the former proves uneconomic, unlike sugarcane which tends to exhaust land faster and its fertility restoration takes longer.

The non-adopters of coffee on the other hand gave various reasons for their negative response. Their negative responses manifest the fact that there is general conservativeness and resistance to change among some farmers. For instance, some farmers claimed that there was no need to grow coffee because other crops were adequate and that coffee is not a food crop. They argued that coffee would reduce their cultivable areas of land suitable for essential traditional food crops. Coffee was seen as requiring a lot of labour because of the fact that it needs attention almost throughout the year. Some farmers cited of physical energy exerted; and fluctuations in prices as a commodity that could not be relied upon. It was also argued that the crop takes
too long to mature compared to the traditional crops, hence returns are not immediate. As an extension of this immediate returns mentality, some farmers saw hired employment and trading activities as the only sure answer to their cash income requirements.

Many non-adopters and those who discontinued to grow coffee are discouraged by cases of poor organization and management of the coffee cooperative society which they perceive being corrupt particularly in regard to the produce weighing and recording practices; favouritism in supplying seedlings and inputs including loans; and bribes in marketing the produce. There is also a general feeling among members of this group that society officials embezzle their funds which, whether true or not, is definitely a negative contribution to the adoption of coffee farming.

Some farmers were of the opinion that it was generally risky to take up coffee farming without prior systematic and planned training to introduce farmers to proper techniques of growing it. Most farmers grew the crop on a trial basis without the assistance of coffee specialists which sometimes lands them into losses. It is suggested that this is a manifestation of inadequate and inappropriate extension services.

6.3 Suggestions to Elevate Farmers' Level of Innovativeness

The findings of this study indicate that small-scale farmers' response to coffee production is not very much affected by the socio-economic and situational factors but
rather by lack of a well articulated set of change agents. The suggestions made here revolve around the need to involve the farmer through encouragement and education.

The government should be directly concerned about cash-crop production by small-scale farmers. There is need to provide well coordinated and persistent encouragement to the farmers through local administrators, that is, village heads, chiefs and community development agents on the one hand, and Ministry of Agriculture extension agents on the other. The coffee management authority and supervision personnel should endeavour to reach out farmers to ensure that recommended techniques are followed to the letter and consequent bottlenecks addressed to immediately. This exercise can be effected through increase in and appropriate training of advisory staff. Farmers should be encouraged to adopt the crop in units equivalent to their managerial and financial capabilities with allowance for intercropping to minimize initial uneconomic yields.

The provision of inexpensive and appropriate inputs and in packages of varying degrees to cater for different economic groups should be explored. Efficient cooperative organization plus a concerted effort at expanding farmers' organizations and their membership will speed up the awareness of innovative practices in the location. In addition, farmers' financial institutions should provide better terms of credit coupled with an aggressive farmer
education programme through the mass media. These measures are likely to make farmers realize their potential in the long run.

6.4 **Suggestions for Further Research.**

It is suggested that a study of this nature be conducted in other parts of the country under different or similar ecological conditions for purposes of comparison.
APPENDIX I QUESTIONNAIRE

1. Name ----------------- 2. Sex -------------
3. Coffee Farmers' Cooperative Society number -------
   (if any)
4. How old are you? ------------
5. What is your level of school education? ---------
6. How many acres of land do you own? ----------
7. How many acres are under crop production?-----
8(a) Do you grow coffee? -- (b) Why do you grow it?----
     (if "yes")
     (c) Why are you not growing it?-------
        (if"no")
9. What other crops do you grow? -----------
10. How profitable are they to you? -------
11. For how long has coffee been grown in this area?------
12. For how long have you been growing coffee?--------
13. What is your approximate annual income from
    farming? (amount in KShs.) -------
14. Do you have any other sources of income? --------
15. (if yes) (a) What are these? -----------
     (b) Annual income -----------
16. How much, by estimate, do you spent on coffee
    production each year? ------- (amount in KShs.)
17. How do you obtain your farm production inputs?
   (a) Cash purchases? --------
   (b) By loan? ---------
   (c) By cash purchases and loan -------
   (d) None of the above -----------

18. Where do you obtain your farm production inputs?
   (a) From market centre ----------
   (b) From KGGCU Kimilili ---------
   (c) From KGGCU, Webuye -----------
   (d) From AFC, Kimilili -----------
   (e) From coffee society, Lukusi ----
   (f) Others -----------

19. Are the inputs easily available? --------(Yes/No)

20. Does the distance between input markets and your farm pose any problems? (Yes/No).

21. What are these problems? --------

22. How do you overcome them? -------

23. How do you transport your inputs?
   (a) Use of vehicle
   (b) Use of bicycle
   (c) Use of OX cart
   (d) Use of animal sledge
   (e) Human Potterage
   (f) Any other --------
24. Do you favour the cost of inputs at present?  
   (Yes/No)

25. How is the cost of inputs?  
   (a) Low  
   (b) Fair  
   (c) High  
   (d) very high

26. Do you have any access to credit facilities?  
   (Yes/No)

27. If yes, where do you obtain credit/loan?  
   (a) From Bank  
   (b) From KGGCU  
   (c) From AFC  
   (d) Any other

28. If no, why?  

29. Do you favour the current prices for coffee?  
   (Yes/No)

30. How are the prices?  
   (a) low  
   (b) fair  
   (c) good

31. Is labour for coffee production easily available?  
   (Yes/No)
32. How do you obtain labour?
(a) Family labour
(b) Hired labour
(c) Hired labour and family labour

33. Do you make any contacts with extension officers?
(Yes/No)

34. How often do they visit you?
(a) once a year
(b) every week
(c) every month
(d) Any other ______

35. Are they of any help to you? (Yes/No)

36. How helpful are they? ______

37. Do you participate in any farmers' formal organizations? (Yes/No)

38. What are they?
(a) cooperative societies
(b) agricultural shows
(c) Field demonstrations
(d) seminars
(e) Any other ______

39. How useful are they do you? ______

40. Do you learn about agriculture through the mass media? (Yes/No)
41. What are they?
   (a) radio
   (b) Newspapers/Magazines
   (c) Television
   (d) Others -------

42. Identify:
   (a) the radio programmes
   (b) the types of newspapers/magazines
   (c) the television programmes

43. How useful are they to you? ----------

44. How are you related to your neighbours?
   (a) through kinship
   (b) through friendship/neighborlihood
   (c) Agricultural business
   (d) Others -------

45. Are they active coffee growers? (Yes/No)

46. Do you benefit from them or they from you? ------

47. What advice would you give other farmers with regard to coffees growing?

THE END
APPENDIX II INTERVIEW GUIDELINES

PART I: FARMER'S SOCIO-ECONOMIC CHARACTERISTICS

covers questions 1-16 focussing on the following aspects:

(a) farmer's age
(b) farmer's educational background.
(c) size of land in acres, owned by the farmer.
(d) various crops grown by the farmer
(e) farmer's perception of the profitability of farming.
(f) farmer's annual income and sources of income.
(g) farmer's other assets.

PART II: SITUATIONAL DETERMINANTS OF DIFFERENTIAL RESPONSE

covers questions 17-32, focussing on the following aspects:

(a) means to obtain farm production inputs
(b) distance between the farm and input markets
(c) cost of inputs
(d) produce prices
(e) accessibility to credit facilities
(f) availability of farm labour

PART III: INFLUENCE OF "CHANGE AGENTS"

covers questions 33-47 focussing on the following aspects:

(a) farmer's social participation in formal organizations
(b) farmer's contacts with extension agents
(c) farmer's accessibility to and use of mass media.
(d) farmer's contacts with neighbours.
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