DIFFERENCES IN RESOURCE UTILIZATION IN RURAL KENYA: A CASE STUDY OF A HETEROGENEOUS SETTLEMENT SCHEME, WITH PARTICULAR REFERENCE TO DAIRY FARMING INNOVATION IN THE NZOIA SCHEME, KAKAMEGA, KENYA.

BY

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DECLARATION

This is my original work and has not been presented for Degree in any other University.

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This thesis has been submitted for examination with approval as University Supervisors.

DR. W. OMOKA
University Supervisor
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Lastly, to all my friends, and educational cohorts, your competitions at various stages implicitly gave me the incentive to be what I am. It can not have been otherwise.
This study examines the individual socio-economic and other governmental extension factors which make for differences in the levels of sustaining innovation in the Nzoia Scheme. This was a case study of a rural planned settlement scheme. In analysing the nature of resource utilization by the farmers here, we laid much emphasis on the dairy farming enterprise innovation. This was because it was considered to be a more relatively steady income generating activity for an average farmer, compared to arable farming activities. In this case we found that maize production in arable farming was the only other most important activity all the farmers in the scheme engaged in full-time each year.

The available data shows that the socio-economic factors, more so income disparities, were quite critical in explaining the success or failure in dairy farming development, and agriculture in general, in the scheme. The dairy farming innovation had been introduced to all the farmers on joining the scheme. However, problems have arisen in failure for most farmers to sustain and improve the general quality of grade dairy farming development on their farms.

On the other hand, we found also that such pertinent governmental services as the performance (and availability) of the extension services (veterinary and artificial insemination (A.I.), the availability or not of piped water supplies, inadequacy of dipping facilities, roads and other communication services had some influence on the production levels differentiation. In this case,
differential accessibility to, use, and availability of these resources was also critical in the general farming, but more so in the case of the dairy enterprise.

In the same light, it was realized that a greater majority of the farmers studied in the scheme were less commercially oriented in their farming production. Despite having relatively large farms (average 30 acres); such farmers were found to produce on peasant lines, largely for their subsistence and the remainder for sale. In this connection it was realised that some farmers never majored in a particular agricultural enterprise strictly on the basis of costs and benefits derived from such. Rather, there was evidence such farmers farmed only routinely - come the planting season, and in some instances, because other farmers also engaged in the same enterprise. This was quite evident in the case of maize farming in the area of arable farming.

Production orientations on such lines shows that very little profits can be obtained, more so as we found that well over 80% of the farmers studied did not keep farm records. In short, therefore, our conclusions were that most farmers production capacities were inadequate to generate a sufficient income to meet the household and other extra obligations faced by the individual farmers in question. This may explain why we also found that there was an inherent problem in the repayment of the initial farm development loan advanced to the farmers when they joined the scheme. In this case, it was found that well over 67% of the farmers studied had still outstanding loan instalments to clear, after 20 years of settlement.
The study also set out to examine to what extent the farmers' performance in the scheme met what had been the very objectives of setting up such planned rural settlements. These revolved around the provision of land to the supposedly landless Kenyan citizens; the need to increase agricultural production, and thus provision of a viable income source to the settlers; and to stem the afore-thought rural-urban migrations for employment. The findings reveal that though most farmers were producing at least beyond their subsistence levels, in general production capacities were below average in maize and dairy farming enterprises. Some farmers' performance showed a lot of underutilization of land resources as they tilled only small patches.

In dairying, there were very few farmers who undertook this enterprise on a commercial basis, and hence the very declining nature of this enterprise in the scheme.

Such production levels for most farmers will also mean low levels of income in return. The consequence then will be that such farmers are unable to provide substantial employment opportunities on their farms, implicitly self-defeating in alleviating rural unemployment. Additionally, such low levels of income to the farmers only means that they can not offer attracting salary packages to the prospective job-seekers in such areas.

In a nutshell, therefore, our observation from this study reveals that the major aim achieved in the creation of the Nzoia scheme could best be described as providing land to the landless. The other aims mind during the plan for such schemes appears to be far away from being
achieved. There is therefore greater need for the farmers to drastically improve and increase their production capacities if the other aims have to be achieved, somehow. This will however, need greater sacrifices in an attempt by the government to provide sufficient extension services, (more so in dairy farming development and improvement on communications and marketing facilities in the region generally.
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CHAPTER ONE

INTRODUCTION

1.1: The Research Problem:

This study attempts to explore the various factors which might help explain some assumed differences in resource utilization among the farmers in the Nzoia Scheme. The point of contention is whether among the many agricultural activities alternatives, one can choose the most beneficial as the major activity on the farm. In a way, this will definitely centre around a farmer's good judgement of entrepreneurial work, and thus maybe be able to take a risk in so doing to make out the best alternative in the various farming activities and opportunities so available at his discretion. Such activities may range from arable/cash crop farming, dairy farming, horticulture, poultry farming, and piggery, among others.

In so analysing, we are thus faced with the problem of whether farmers are consciously aware that the major activity on the farm is also necessarily the best paying, in terms of returns, since it is assumed that their production capacities are necessarily beyond the subsistence levels. In this light therefore the question is what criteria does a farmer use in choosing whichever activity is considered as the major one on the farm? If otherwise, how far are the farmers ignorant about what should be the major activity on the farm, and what is the magnitude of its spread in the scheme?
For the purposes of this study, we will mainly focus our attention on dairy farming development in the scheme. For one, this is an activity that can most likely generate income all year round, other factors being constant, at least compared to most arable enterprises on the farm. Hence for a farmer more concerned with the generation of a more steady income, dairy farming would most likely be a consideration as the major activity. Secondly, the Nzoia Scheme also geographically falls within the former "White Highlands" and therefore quite potential an area agriculturally. Thirdly, albeit later, the Nzoia Scheme had been one of the offshoots of the 1953 Swynnerton plan which had laid special attention to "high potential" lands to produce a prosperous African agricultural population with the then targetted earnings from individual holdings set at no less than £100 (Odingo 1967:142). It had also been the aim of such settlements to help 'assuage unemployment which had resulted from the departure of some European farmers at the approach of independence and the period immediately after," in Kenya.

Odingo (1967: 147 - 148) had also noted the overall costly nature of setting up land settlements in the former white highlands. This was due to having to buy out large scale European farms by the Kenya government, and thereafter pass the loan repayment responsibilities to the farmers. For the Low Density Schemes of plots of thirty seven acres on average, and in which the Nzoia scheme falls, the average cost of settling a family on the scheme was no less than £814. Therefore, as the author concluded, this method of rural development by settling
farmers in the Kenya Highlands was extremely costly. The question we are confronted with is whether the individual farmers really understand the cost that was involved, and whether they can make sure their production capacities are aimed at investment in an activity most paying in terms of receipts? Did the individual farmers really understand the government's objectives of setting up such schemes? In this case, among others, there had been need to provide land to the landless Kenyans, an undertaking that should have increased the total agricultural production, provide sources of income for the individual farmers and employment opportunities for other jobless Kenyans as farm workers. To what extent have therefore such objectives been achieved? In the same light, we have to remember that it was the individual farmers on whom the ultimate burden of repaying the loan had to fall, largely from the receipts from the agricultural produce. That aside, this income from farm produce should also be able to sufficiently nourish the financial needs to the farmers in question. How far can this be upheld?

1.2: The Objectives:

These will centre around the examination of the various socio-economic factors which make for differences among individual farmers in the nature and success in dairy farming in the Nzoia Scheme. We therefore seek to isolate these and show how significant they are to each individual farm land. Thus, what individual factors, as compared to other external or collective ones, account for the
nature of the differences in dairy farming development? This is with the assumption that the farmers in the Nzoia Scheme were given more or less similar opportunities to make a start at farming generally. More specifically, therefore, the following are the outlined objectives:

(a) To show why there are perceived differences in the nature of dairy farming development at the individual farm levels;

(b) To examine whether the farmers in the scheme major in a particular agricultural activity specifically on the basis of the very corresponding income receipts from it, as contrasted from other activities;

(c) To analyse how far the farmers production capacities can be able to generate sufficient income to meet both subsistence and other extra obligations faced by the individual farmers;

(d) To examine whether the overall performance of the farmers in the scheme meet what had been the stipulated aims of setting-up such settlement schemes.
CHAPTER TWO

THEORY, LITERATURE REVIEW AND HYPOTHESES:

2.1: THEORY:

Kenya falls within the category of developing countries which have numerous problems hindering their endeavours to development, both in the economic, social and political spheres. Like other nations in the developing world therefore, the scope for development lies in the rural resource utilization in the development of agriculture, a sector dominantly concomitant with the present developing countries. Furthermore the virtual absence of any known mineral resources in such nations glooms any faster attempts at development. It was thus partly due to the realisation of this latter consideration that, for our case, Kenya after independence chose to develop the agricultural sector, among other factors, in a bid to fight poverty, illiteracy and therefore ignorance. These were the ideas manifested in the Kenya Development Plan, 1966 - 1970 (Ndegwa and Norbye, 1967: 87-90). The then frame of reference was in line with the modernizing ideas, for instance the need to modernize traditional agriculture by providing readily available consumer goods, for people to send their children to school and get immediate hospital care.

The need, therefore, to exploit agricultural and related resources lay in the government's efforts to create motivating media or
would have been swayed to farming as a favourable enterprising business; the effect of which should have halted possible population movement to urban areas for job opportunities where the factorisation system had just started to emerge. Such incentive included land consolidation and registration, provision of credit facilities; to establish a network of extension services, more so farm training centres; better communication facilities and market centres (Ndewa and Norbye 1967: 92). The policy of resettlement or creation of settlement schemes appeared to have been a definite off-shoot of this very realisation; in which case the government itself had become an agent of change - just among others that had been applied during the historical period of post-independence Kenya.

Such lines of development have never, however, been without fault, a view exemplified amongst many rural developmentalists (Lele, 1975: 19; Hunter, 1969: 3-43; Oloya, 1968: 1). Indeed the problem of rural poverty has always persisted even to date, so that it is no longer a localized issue, as seen in the statement quoted from the then president of the World Bank, R.S. MacNamara (Lele, 1975: forward), "How to raise productivity among the rural poor in developing countries is one of the two or three most urgent questions confronting the international community today." Such concern would appear to derive from implicit disillusionment that may result from high rates of failures in change agencies to make any impact on development programmes in developing countries. Indeed
why, despite trials of a great variety of approaches by the donor and national agencies, and despite a great deal of experience having been generated from these efforts, should the problem of rural poverty have remained (or even increased?) acute? (Lele, 1975: 1)

It is interesting to realise that the explanations propounded by many western Europe scholars (Hyden, 1983; Hunter, 1969: 3-43; Korten, 1972: 3-13) have always been mapped to the nature of traditionalism and cultural rigidity supposedly conspicuous in developing countries, as contrasted to the then situation in Europe. As a consequence, there has therefore, mistakenly and hurriedly arisen the tendency to prescribe remedial measures in the Economic developmentalist model of western Europe, as the most viable process (indeed linear, Rostow, W.W., 1960) by which the transformation of the developing countries shall occur. However, the present historical happenings have proved such lines of thought not only fallacious, but also inapplicable to developing countries. In any case even "Rostow's Stage model" does not have a smooth flow (Higgins 1959: 178).

It has been shown historically thus, that we can not replicate the social, political and economic conditions under which Europe underwent in its transformational epoch. Even to justify this further is Hunter (1969: 3) in his analysis of agricultural development being inseparable from non-economic elements in life of a society -
its history, beliefs, ambitions and ideals. The author further states that though technology exists for borrowing, it is unsuited to their needs (developing countries) - usually designed for large-scale production, requiring capital and skills of which they are short of. Economical in labour of which population problem in Africa means abundant surplus labour and ill-adapted to their land tenure and social pattern. A study carried out in Pakistan on peasants (who in Rostow's terms were pre-Newtonian in Science) however indicated that in most cases failure of change agencies programmes is due to their incompatibility and inconvenience (Refugio: 1972). Here was thus introduced a new type of wheat variety suited to local conditions and which never demanded extraordinary sacrifices on the part of the farmers as to appear quite alien. What we note here is that it was thus within the realm of the farmers convenience and without any doubt ended as one of the best and successful agencies programmes which had revolutionized wheat yields drastically, but within the prevailing cultural system.

2.1.1: The Modernization Model:

The concept of modernization is a relative one, and basically western Europe oriented. There has hardly been a uniform and/or standard definition universally adopted. This view is reflected in the work of Weiner (ed) (1966:4) who holds that since there has never been a precise and concrete definition of modernization, some scholars have suggested that therefore the starting point of any definition of modernization is not in the character of the society,
but in the character of individuals. The author went at length to review the views of various scholars, for instance, Black (a historian) is quoted as seeing modern societies as characterized by the growth of new knowledge and that presumes the existence of men with an increasing capacity to understand the secrets of nature and to apply this new knowledge to human affairs; Mclelland (a psychologist) is seen to underlie self-reliance and an achievement oriented as the essential qualities of a modern man; while on the other hand, Anderson and Shils (Educationists) stressed the development of skills and a spirit of creativity. As Weiner, (ed) (1966:4) had seen thus, the general consensus among the above scholars revolves around conception of new ways of thinking which make it possible for men to create modern industry, modern society, and modern government.

Mclelland, (1962) is also quoted as holding that the existence of certain modern attitudes are a precondition to development, for example that effective entrepreneurship presumes the existence of a way of thinking that leads men to behave in a particular energetic way. This is the psychologist "need achievement," and that on the contrary, family particularism is an obstacle to modern entrepreneurial behaviour, as are fatalism, laziness, a preference for leisure over work, consumption over thrift. Upto this extent, we are compelled to content with the question, are the differences among the dairy farmers in the Nzoia Scheme basically a function of the above analytical framework? If this can be held true, what parallels does this difference take in this case? Is this
It is indeed true, to some extent, that societies, through historical time, differ in their conception of their social, political and economic lives. At face value one is led to dichotomise any two societies as modernizing and the other still traditional. This is the contention which Weiner, (ed), (1966:6) had in his analysis of how a society starts to modernize. He sees Max Weber's ideas that certain traditional societies had within them seeds of modernity - that the development of commerce, the emergence of the political autonomous urban centres in the late medieval world, and above all the Protestant Reformation, laid foundation for modernization in the West. In this case the value system of Calvinism contained the "need achievement" that made modern entrepreneurs possible. In part, however, Alexander Gerschenkron (Weiner (ed) 1966:6) differs with this view, and holds that Calvinism (might have) facilitated development, but that many value systems seem to exist in modernizing societies. To this, Weiner, (ed) 1966) adds that Catholicism has apparently not impeded the extra ordinary high rate of economic growth of many Latin American countries through the 1950's; nor does any analysis of religious beliefs throw any light on why Indians and Chinese have been so much more productive outside their home societies than within. Additionally, Stanislaw, (Weiner, (ed) 1966:10) sees less of values impeding profitable economic activity, since people often described
as indolent in one environment may prove to be effective entrepreneurs in another. Richard Lambert (sociologist) has the same views (Weiner, (ed) 1966:10).

Upto this level therefore, there are distinct differences among social scientists as to how values and attitudes can be changed. One school believes, atleast, that attitudinal and value changes are prerequisites to creating a modern society, economy and the political system; while other social scientists have taken an alternative model that appropriate attitude, and more vitally, the appropriate behaviour will be forthcoming, once the opportunities and incentives are provided (Weiner, (ed) 1966:9). He holds further that in this latter category are many economists and political scientists, for example those who point to the existence of institutional impediments to productive activities in many developing or modern systems, such as land tenure system that deny peasants the gain from increasing productivity, taxes that slow the flow of goods from one portion of the country to another, and elaborate bureaucratic regulations that retard the rate of investment. Might these structural impediments be applying differentially to farmers in the Nzoia scheme to have a leaning on nature of resource use?

Hunter (1969: 30-31) theorizes three basic stages of modernization in the process of agricultural change and development. The initial stage is the traditional society - with traditional religion, social relations and agricultural methods being so
traditional and unchanging over a long period of time. The second stage comprises those societies which are already drawn into the modern economy too far, who may grow cash crops and use fertilizers, but are yet strongly held in the traditional land tenure, values and instincts of the past still hold. The third stage is the modern, with commercializing farmers who increasingly have accepted a modern outlook and are finding ways of avoiding traditional restraints which no longer have a binding force upon them. To some extent, we can favourably infer that most of the farmers in the Nzoia Scheme lie between the second and the third stages; but also with a likelihood of some still in the traditional society. This could be so because, in part, this model lacks a 'smooth flow' also, so that in most areas, if not all, there is bound to be a lot of unevenness amongst different societies on the one hand, and individuals on the other. Can therefore, such individual differences in modernization levels in the Nzoia scheme explain why there could be perceived differences in the nature of resource utilization in relation to dairy farming capacities? And to what extent can such an explanation be upheld, amidst other intervening factors? For instance, Hunter, (1969:82) considers that the question of values has to be considered in the process of agricultural development, and that social and cultural ties in the stage of modernization of attitudes, religious convictions, education, health, position of women in society etc. will all determine or condition the types of approach to economic advance which can be used.
Nyangira, (1975), on his part, in analyzing the variations in public policy outcomes in Kenya, concluded that this had a relation to the levels of regional modernization differences. He defined modernization as the process of creating modernity, adaptation which is characterized by growth, differentiation, integration, specialization and complexities in the structures of the social system. That modernity could be measured on such indices as the rate of exposure to urbanization, per capita income levels, educational and political awareness. He had observed, that high rates of modernity are positively correlated with high levels of modernization. He sees "relative modernization" - the variation in the levels of, and rates of modernization among regional units, individuals and institutions - as setting the very differences correspondingly in resource use. Nyangira's conclusion was that there was a comparative advantage in resources and their allocation, on the same basis. His framework of study took case by case, from which he held that regions most modernized (using indicators as seen above) have more access to allocation of educational resources (those areas in most cases which historically or geographically had to have earlier and more intensified contact with the western world); will also have more agricultural allocation as are highly receptive to change and thus commercialization as compared to the more conservative peasant areas of the same nations; that population pressure had historically been related to the motivation to innovation and thus modernization, and that therefore with the creation of settlement schemes, the transfer of population and resettlement favoured most those areas originally
more modernized. For our case, this latter factor is quite important, for the question we are to contend with is as to whether the structural differences inherent in heterogeneous settlement schemes is basically a function of such derivations from different regions and with their modernization levels? If such an analysis could be upheld, then no doubt the Nzoia scheme then must have derived its population from both modernizing (or modernized) and the more traditional ethnic groups; but how far can we explain the present economic polarisation basically as being due to the differences in modernization rates when the farmers joined the scheme?

On the one hand, we could easily be tempted to conclude by upholding the above, basically from the fact that, in the long run, such differences have had to appear in the form of agricultural commercialization variations, use of extension services, ability to take credit, entrepreneurship capacities, in our case as it relates to dairy farming here.

The foregoing discussion makes us attempt the specification of the constraints of development to each particular environment, an attempt to move from generalizations as many European scholars have done in relation to developing countries, as we saw earlier. We shall thus work on the presumption that there are obvious regional differences both in ecology, climate, social, political and environmental factors generally. This indeed then should preclude
reduction of development analysis on regional or areal levels. In our case, we attempt to go further than this to the individual level in trying to analyse factors which account for the differences in the nature and pattern of the resource utilization in relation to dairy farming in the Nzoia Scheme. Such a level has had little emphasis in the area of agricultural development by agricultural and even economic developmentalists. For instance, Hunter, (1969: 25) only mentioned the need to reduce the units of analysis from whole nations to smaller levels, but quite an attempt to break through with the usual wholesome stereotyped notions.

2:1:2: Growth Models and Rural Development:

Essang, (Nov. 1978:36) sees the prevailing lines of development in most developing countries as tending towards emphasis on rural development, development of agriculture and related activities, the modernization of rural infrastructure, and the establishment of small-scale rural industries. Such has aimed at increasing rural incomes and employment, increase supply of farm output to match the rising demand by the fast growing population and urban industries; stem the tide of rural-urban migrations, and most vital, raise rural welfare by providing equal income earning activities or opportunities for rural inhabitants and improving the quality of rural environment. Essang however contends that the type of rural development strategies adopted by policy makers in countries concerned will to some extent be influenced by the existing models of economic
growth to which policy makers and their advisors might have been exposed. For our purposes, two of the models considered are directly applicable, and are considered below.

(a) The High Pay-Off Input Model:

This model has been attributed to Schultz, T.W. (1964), one that assigns a strategic role to new high yielding varieties and educated labour. The aim was to explain why the traditional agriculture is characterized by low incomes and low productivity despite its competitive structure. The farmers in this sector are seen as rational and positively responsive to price incentive; are efficient resource allocators under the constraints imposed by static technology and existing factor endowments. But despite all these (as seen by Essang) they remain poor as have exhausted all the profitable opportunity to invest in the factors at their disposal. That the operation of diminishing returns in a situation of static technology ensures that hard-work and thrift do not bring high rates of return. That hence, and since farmers have already allocated their resources efficiently, no useful purpose would be served by farm management and extension programmes directed at a more efficient resource allocation in the traditional agriculture.

Hence to be worthwhile, such programmes should include a package of high-yielding and profitable new inputs on which farmers can invest (grade dairy animals in our case). This was indeed a realisation observed in a study on dairy grade cattle establishment
in Kakamega, over the local Zebu cattle (Chitere, 1976:39).

Essang also observed that given the positive price responses exhibited by farmers, that Schultz, T.W. (1964) had also argued that agricultural modernization strategy must emphasize a price policy which lower input prices, and raises those of outputs in an effort to obtain a favourable input - output price ratio. That agricultural modernization can not further more proceed far unless there is investment in research to produce and diseminate inputs embodying new technology and in the education of rural people on whom rests the task of allocating the resources of development. That Schultz contention was that such investments are associated with very high rates of return compared to investments in the alternative projects. In this case, Essang notes that Schultz used this model to justify why there are differences in agricultural incomes and productivity among countries, thus a reflection of differences in the scope and quality of investments in research, technology and education among the countries concerned.

This model is seen by Essang to have alot of relevance for rural development in less developed countries. First it provides a framework for a positive price policy in the context of agricultural development; secondly, provides a justification for government investment in agricultural research and training of agricultural scientists. That it shows that investment in research and education have higher social returns than comparable investments in alternative projects and thus lending strong support to current
efforts to step up and intensify investment in agricultural education, extension and research; thirdly, it provides part of the explanation for the observed failure of farm management and extension programmes to increase productivity in agriculture. That until recently, extension and farm management experts busied themselves with resource allocation problems and ignored the critical question of price incentives, new technology and the opportunity cost of following extension services advice; and fourthly, the model provides strong support for current effort to boost export and food crop production through subsidization of the purchase of pesticides, fungicides, fertilizer and higher yielding varieties.

(b) The Diffusion models of Rural Development:

Essang holds that these models make an attempt to explain the existence of substantial productivity differences among farmers in the same economic and geographical regions. Accordingly therefore, such differences arise due to differences in the farmer's adoption of new varieties of seeds, mechanical and chemical inputs. In our case we are to content with how far the farmers in the Nzoia scheme could retain or sustain the new ideas they were introduced to (dairy farming and its management). That the path of agricultural and rural development lies in narrowing the existing productivity differences through the diffusion of technological innovations; and hence the authors of these models are said to concentrate
on the analysis of the various techniques for diffusing innovation to farmers. In this case the focus is mainly on the techniques of communication (by the extension service to the farmers). In an attempt to find the most appropriate method for such diffusion of innovation, policy makers and extension administrators resort to a number of devices, such as experimental stations and demonstration farms which aim to help in the spread of new techniques through demonstration effects. This was also an observation made by Chitere (1976:63) quoting Rogers and Shoemaker, (1971) on the essentials for the diffusion of innovation.

Essang also holds that there has usually been tendency in some countries for emphasis to be placed on 'progressive' farmers and local leaders whose production techniques and farm organization are held up as examples to be followed by the farmers in the immediate locality. How far this technique can be successful is however questionable, especially for our case in the Nzoia scheme as relates to dairy farming development.

2.2: Literature on Dairy Farming:

Many of the works around dairy farming in Africa (and Kenya in our particular concern) have in most cases been only generalisations of the basic ideals to be followed by the farmers. Professor Musangi (1971) deals mainly with problems of dairy farming management procedures, with least emphasis on the human and individual factors in this. In the same trap are Allson and Phipps,
mentioning the need to establish the quantitative returns from dairy farming and to determine whether there are any expenditures made in the same. In our case, this will definitely also form the basis of our analysis at the individual farm level in the study of the Nzoia dairy farming.

Crotty (1980), apart from analyzing the various management procedures, dwells mainly on the need to increase profit margins through commercialization and sale of dairy products to the market. Indeed, even dairy farming commercialization in Kenya would be uneconomical on small holdings combining such with arable farming. F.A.O. (April, 1973) was more concerned with the overall low livestock production, under - and improper utilization of resources of pasture, low herd productivity generally and inadequate infrastructure, and which have to be improved if dairy development has to be feasible. This is indeed true when consideration has to be made particularly in the area of development of access roads to effect easier accessibility to collecting centres and marketing points for dairy products. It is worth noting that concern had also been extended to the idea of overhauling the traditional sector and the creation of the modern sector. For the Nzoia scheme, problems of the traditional sector are likely to be exemplified in the individual farmer's introduction of inferior Zebu cattle in the schemes whose management requirements hamper on productive dairy farming, leading to overall declining yields on the farm. F.A.O. (1973) also had made an effort to consider the creation of more
feeder roads in the interior areas, as experience has shown that large supply of milk are left at home due to lack of bigger carriage facilities (in most times this is done on bicycles to collecting centres more than five kilometres away).

Nylholm, (1975) concurs with F.A.O. (April, 1973) in his notation of the need to change the attitude of the rural people in order to increase agricultural production. He thus considers the socio-economic factors in the economic development, such as the role of cattle in social life and its uses (the Indian case) and the extensive nature of grazing practices. The nature of the economic behaviour of farmers is also considered, such as non-breeding, non-replacement of stock or non-investment in inputs for increased milk production (a concern exemplified in India's second 5-year plan, 1956 - 1966). Nylholm also discusses the nature of model transfers from western Europe and how reliable they can be in dairy development in the Bangalore milk area (India) where farms are too small to handle the technology propagated by development agencies. Hence from this, there is need to adopt such technology as is only suited to local conditions and in the economic convenience of each farmer. This generally fits into our concern in that there was an attempt to focus the methodology on individual households and the socio-economic factors at the individual level.

Russel (1962) though basing his work mainly on the British dairy industry, and highlighting problems of peak production and
need for elaborate management procedures, discusses the question of cost-effectiveness in decision over dairying or crop farming and which is relevant to this study. We will thus seek to analyse the pattern of cost-benefit factor in allocation of resources by farmers between dairying and other competing alternatives of farm use. There is need to attempt to find out in this study whether farmers actually focus on profit per cow in the economics of milk production, in this case to know whether the extension service gives such information to them. This is a factor many scholars in Africa have given little emphasis. For instance, Malcolm (Musangi, K., 1966) only notes that resource allocation in dairying and other enterprises has to be in such a way that the return to land, labour and capital and managerial skills is economical, without much elaboration. Even F.A.O. of United Nations (April, 1966) on the Regional Conference on Dairy problems in Africa, held in Nairobi, Kenya, only recommended, among others, the need for the highest possible return to the producers for milk supplied for liquid consumption either directly or preferably through processing plants. Such a conference ironically never touched on the social and cultural inconveniences in milk production in Kenya (in such schemes as the Nzoia). The only noted problem here was the decline in dairy herds in the period preceding acquisition of independence (upto 1964) during the change of hands of the dairy industry, originally dominated by Europeans in White Highlands.

With the same line of view was Wells (1968) in his consideration
of the problems emanating from the transfer of land from Europeans to Africans. However, for him there is a more coherent analysis of the problems of dairy development in post-independence Kenya:

Poor husbandry and management of animals which in most cases was below average; low yield per cow due to the decline in genetic potential of dairy cows, progressively: that most milk producers in Kenya attain levels of production far below capacity of their cows due to underfeeding of their livestock, laxity in applying disease control measures, all which have to be solved at the individual level first (thus unhealthy cows of one farmer will most likely pose disease hazards to the rest of the other farmers' animals as they are potential disease transmitters, through using such common facilities as dipping). On the question of low supply and long distances, Wells (1968) and Musangi, (1971) have concurrent views. For instance that individuals have had to supply as little as one pint of milk and walk long distances on poor and impassable roads to collecting centres. Hence Wells (1968) appears to reflect that it was these problems which prompted the Kenya government in its development plan (1968-73) to stress the need to increase production per cow through improved husbandry; was to set up the animal extension department programme in feeding, pasture management and improvement. There was need in this plan to realize as has already been noted, the crucial factor of differences on regional and individual levels where lasting results had to be attained. This ties with individual decisions at farm level in the nature of resource utilization, a factor which Kenya's Fourth
Development Plan (1979-1983) appeared to be well aware of - in its bid to generate economic growth and alleviate poverty, the solution lay in full utilization of the then underutilized resources in the rural areas, amidst the perceived potentials, for example cases where plots in some schemes had been left idle for long periods. The Plan atleast went further to consider the problems of complexities of rural areas in this context (economic, social and environmental factors) in agricultural development. This sought to emphasize on regional basis in assessing the nature of local needs. In a way, this was in line with the District Focus for Rural Development Programme. But in areas such as settlement schemes, what the government saw as regional differences, at national level, are likely to be manifested at the individual level, in the nature of the resource allocation and utilization at the individual level, in heterogeneous settlement schemes. Hence to some extent, this should have been a consideration, too.

A study carried out in India (George and Chokshi, Jan, 1977) serves as the best example on dairy development decisions at farm levels. They hold that "...success of dairy development programmes depends as much on efficiency in the procurement of milk, processing and marketing activities, as on the influence of such programmes on farmers decisions related to investment patterns in dairy and milk production and disposal practices." In this case, a dairy farmer is seen as having to grapple with three major decisions: How much to invest in dairying; what kind of milk production practice
has to be adopted and how to utilize the milk produced at home. Truly therefore, as seen by the authors also, these decisions will determine the quantity of milk produced, the nature of land utilization pattern among competing farm alternatives, investment patterns in dairy foodstuffs, such as purchase of high grade cattle and stock replacement, family consumption of milk, dependance on milk, and interaction with the local community in terms of organizing collective activities (Co-operating). This study, though largely based on India, has a lot of relevance to Kenya, and more so the concern of this study as relates to patterns of dairy farming in the Nzoia Scheme.

As seen for the case of India (George and Chokshi, 1977), despite a number of studies having attempted to determine factors influencing the pattern of milk production and marketing decisions by a farmer, the existing studies do not provide a comprehensive analysis of the factors, influencing the farmers decisions on investment in dairy milk production practices and milk marketing. Indeed, the F.A.O. (April, 1966) conference on dairy farming problems in Africa never touched comprehensively on these, and at best only mentioned them for other countries other than Kenya.

There are a number of vital observations we can make from the emerging discussions by George and Chokshi (1977) in India: First that investment patterns in dairy farming will depend on the profitability, risk, availability of capital, labour requirements, and
such social factors as family tradition and religion. To some extent, these views are common to Higgins (1959) who held that for an individual to have incentive to work harder or better, or to take additional risk with ones capital, one must be clear of the use to which the additional income is to be spent. Can we therefore infer that at the individual level those who understand more these factors are more likely to produce more milk through taking more risks in dairy investment? And to what extent can the farmers have been made aware of such risks involved when they joined the Scheme initially? According to the same author, global high fertility rates, more so in developing countries, has indirectly played a disincentive to the growth of private savings and investment to produce a flow of income. At the individual family level therefore the amount of private saving and investment (in dairy farming?) will correlate to the density of the dependants to an individual farmer, such as the amount of milk to be disposed to the market and pattern of landuse, other competing dependencies such as investment in education, and housing.

Secondly, decisions at farm level will be dependent on farmers attitudes towards changes in the environment, such as availability of credit, utilization of rates of extension service in form of veterinary and artificial insemination services availability. It had been found, for instance, that farmers with low education levels had tendency to keep large herds of cattle of low quality, had made less investment in cattle sheds and other fixed structures. That
also there was a higher correlation in higher levels of education with the tendency to invest in more expensive cattle (high grade) and related structures, (George and Chokshi, 1977:17). For our case we shall also attempt to show whether these same findings can be replicated in our study.

In summary, there is need to shift the emphasis from earlier dairy development plans which were heavily oriented towards building up infrastructural facilities for milk plants. This was the view prevalent in Kenya during the F.A.O. (April, 1966) conference in Nairobi - proper hygienic conditions, processing of milk, efficient transport and storage facilities. However, there is need for an integrated approach incorporating production and enhancement at farm level, procurement, processing and marketing of milk for a sustained growth of dairy industry (George and Chokshi, 1977). The Indian case typically shows that a well established dairy industry serves the interests of a large number of small and marginal farmers in rural areas. That hence the success or failure of dairy farming development programmes depended on the ability of the programme to influence the farmers decisions and utilization of milk. There should be enough incentives in this case which can influence the farmers decisions on the levels of milk production at the individual farm level, and the scheme as a whole.

From the foregoing discussion, it is also evident that the penetration of governmental and other development agencies services
will be reflected at the individual level performance. For farmers to use, for example extension services, they have to be aware of their existence, a task which extension staff at village level has to grapple with. The best example to support this view was carried out in Pakistan on the supposedly very traditional peasants where a new variety of wheat was introduced with maximum success (Refugio, 1972). The best celebrated medium here was the extension field officer at the village level, who channelled the vital information both theoretically through discussion with the farmers individually, and with practical demonstration plots on a few selected peasant plots. It is our contention that there is need to establish, in our case, the nature of the extension service staff relationship to farmers. Is the extension service adequate at the individual level, and how far can the present levels of production be attributed to it? Here we should note, (as seen by Mbithi, 1974) that the common bias of extension services has mainly centred and focused on large scale farmers; and this has in most cases failed as a means of diffusing innovation to other farmers in the locality (Essang, 1978).

For the Pakistan case, we realise that the ease with which, and the short period during which the dwarf wheat was adopted was due to the degree and extent of the penetration of the advisory agricultural development service; though there were compromising factors such as better yields registered, the relatively simple technology used and thus understandable, needing no major overhauls in
the social structure. This achievement greatly contradicts many western Europe agricultural developmentalists' and economists' outdated notions that traditionalism is the basic barrier to innovation and thus agricultural commercialization and/or modernization (Hyden, 1983; Hunter, 1969; Korten, 1972). In this case therefore we are confronted with the task of analysing the nature of the information flow between the extension service officials and the receiving individual farmer, to determine the pattern and failure of agricultural development programmes. In our case, once more, one can not do without analysing the situation by isolating the individual cases.

We want to justify the need to direct our agricultural development attention more at the individual level decisions, as there are individual constraints to development and hence differential knowledge and accessibility to available resources to be used in this case. In the same context, there is need to focus our attention as to whether dairy farmers apply cost-benefit analysis in their farming procedures. Not many studies have been able to isolate this factor for consideration more seriously. We believe this is the only way individual farmers, if made aware, can be more conscious of their production capacities in their resource allocations to various farm competing alternatives. To some extent, it may be true to suggest that many farmers may engage in very unproductive agricultural alternatives without being conscious of this. Such a venture would thus tickle their imaginations into reconsideration
to engage in more productive enterprises, given the meagre resources at their disposal. From this, it can also be possible to account for the nature of cause and effect relationship in dairy and crop farming enterprises - such as responses to price changes in relation to the amount of milk which can be produced, or decisions to abandon or increase an enterprise altogether.

However, the argument for cost-benefit analysis is expressed with the awareness that there are problems of poor management due to improper record keeping, or none at all. To start with, however, there is need to try and focus on more concrete financial investments such as long term bases which most farmers can be able to remember mentally as can be the case with investment in purchases of dairy animals and related structures. More detailed expenditures on daily basis will require more elaborate research designs and which have to be over longer time periods, if one has to keep track of all the dairy expenditures and production records. It is therefore hoped that this preliminary study will motivate comprehensive studies in the same direction later on.

2.3.1 HYPOTHESES:

1. That higher amounts of income which accrue to a farmer leads to more investment in milk production.

2. The intensity of the penetration of the extension service (at the individual level) and how the related managerial advice in dairy farming is received has a relation to the amount of milk produced.
3. The production of milk far above the subsistence requirements correlates to dairy farming enterprise as the major activity at the individual farm level.

4. The larger the number of dependants to each household, the greater the drain on financial resources, and thus the less there is to invest in milk production.

2.3.2: Variable Specification:

These are specified according to the order of the hypotheses as presented above:

1. (a) Variables: The variables in the first hypothesis are the amount of income as the independent variable; while invested amount, in milk production, is the dependent one.

(b) Indicators: The various indicators sought in the collection of data include all sources of incomes to a farmer, such as employment opportunities and out-of employment activities such as business shops, butcheries, matatu operation etc.

The amount of milk produced is measured on daily production in Kilogrammes or gallons; Investment in pasture fields development, dairy farming structures such as dipping facilities on the farm, stock replacement etc. The focus was mainly on the period extending up to five years backwards, on the farm's dairy development.
2. (a) **Variables:** The intensity of the contact of the extension service (at the individual level) and the method of dairy farming managerial advice will be the independent variables; while the amount of milk produced is the dependent one.

(b) **Indicators:** The intensity of the contact of the extension service will be measured by the frequency of visits from the veterinary officers, dairy farming advisors, artificial insemination officials etc per week, month etc up to the last five years, in as much as the farmers will be able to remember. We shall also seek to establish whether the farmers have the basic knowledge of the requirements in dairy farming management, such as stocking rate, breeding requirements etc, to be cross-checked with the quality of their animals etc. We also seek to know whether the methods used to channel the managerial advise is practical/demonstrational, or simply verbal and theoretical.

The amount of milk produced will be measured in the number of gallons or kilogrammes daily, in the last five years period.

3. (a) **Variables:** Dairy farming as the major activity on the farm is taken as the independent variable; while milk production far beyond subsistence levels or requirements is the dependent one.
(b) **Indicators:** Dairy farming as the major activity on the farm will be measured in relation to the amount of land allocated to it, investment patterns, where if more than any other land utilizing activity on the farm, and incomes received from such an activity.

Milk production is measured in Kilogrammes or gallons on daily basis. We also look at the quality of animals on the farm; pastures planted and the number of attendants, as can be compared to other farm activities.

4. (a) **Variables:** The number of dependants and financial drain will be the independent variables; while investment in milk production will be the dependent one.

(b) **Indicators:** The number of dependants will be measured in population size in the family, number of children in school and fees amount paid per year over the same five year period.

Investment in milk production will be measured in the availability or not of developed dairy farming structures, pastures development and other provision of livestock feeds; the replacement of old stock and the present dairy animals breed quality.

2:4: **Operational Definitions:**

Resource Utilization:
resources as, "The collective means possessed by any country for its own support or defence.". In our case, this will apply to collective means at the disposal of the farmers in the scheme, such as land, water, extension services, credit facilities, capital formation and use, labour hiring etc.

FARM RECORDS:

This relates to the recording of various expenditures on inputs into the farm's production processes; and the receipts that accrue in return. Such will include costs of production, such as cattle feeds, veterinary service costs, milk yields (per cow), cattle replacement, extension officials visits etc.

Income to a household:

This is the income a farmer earns from both the farm enterprises (cash crops, milk sales etc) and the non-farm businesses such as job opportunity, shops, butcheries, house property, land rent, wages etc.

Entrepreneurship:

As used here, this relates to the organization and co-ordination of physical resources of land, and labour, capital etc by an individual farmer (head of household) at the farm level. It thus involves the function of seeing investment and production opportunities, organization of an enterprise to take a new production
process, raising capital, hiring labour, arranging for supply of
the raw material (inputs) and combining these factors of
production into a going concern; introducing new sources of
natural resources and selecting top managers for the day-to-day
operations (Higgins, 1959).

Risk:

Walsh and Williams (1969) see this as relating to a situation
whereby although the outcome with respect to some phenomenon which
affect the calculations is not known or accepted with certainty,
the estimators (farmers) at least have some idea, in probabilistic
terms of what the range of possible values will be. This brings
in the concomitant term of 'uncertainty' - where the estimators
are not even able to be fairly precise as in the case of the 'risk'
situation. Since the normal run of projects (enterprises) involve
at least some risk, private investors (individual farmers) will not
invest in a farm enterprise unless the prospective returns on
such an investment is somewhat higher than it would be in a
riskless situation.

Cost-benefit analysis:

This will relate to the computation of the ratio of the total
cost of incurring a project (a farm enterprise), to the total
benefits or receipts from the same. In this case, a farmer will
only be justified to economically invest in a particular enterprise
(farm activity) if the total benefits exceed the total assessed costs (Walsh and Williams 1969).

Cost-benefit analysis can also be seen in terms of the total relevant costs incurred in using scarce resources (needed to contribute to the desired objectives e.g., having to increase the volume of milk produced on the farm) and the total sum of benefits from producing similarly scarce goods and services, (such as cash-cropping using the same farm resources).

The difference realized between the total relevant costs incurred, and the total sum of benefits should be net profit, which economically one has to strive to maximise from any enterprise where its continued implementation can be justified (Blitzer, Feb. 1977).
CHAPTER THREE

THE RESEARCH METHODOLOGY

3.1: Introduction:

The Nzoia scheme is taken as a case study in an attempt to analyse the differences in resource utilization in rural Kenya, focusing particularly on the dairy farming industry. The head of the household was interviewed on the various aspects of dairy farming on the farm. Such included stock replacement decisions, farm enterprises combination criteria, decisions on the quantity of milk to produce, the combinations of the factors of production, and capital formation and investment patterns on the farm. In this case, the first task was to establish whoever held an upper hand at decisions as seen above in most times during the calendar year. In cases where there were joint decisions undertaken, one of the decision makers could be interviewed, where there was consent. This specifically involved joint decisions between husband and wife on the farm, although generally wives were less willing to grant an interview without the husband's consent. It thus turned out that although the majority of our respondents made indications of making joint decisions and consultations, we ended up interviewing mostly the male respondents, for the reason already indicated above.

3.2 SAMPLING METHODS:

The Nzoia scheme is a region comprising two hundred plots, of an average of thirty acres. However, the total number of farmers
in the scheme was found to be only one hundred and seventy nine. This is so because six farmers were found to have had more than one plot, either several combined together or some plots situated separately. The scheme was settled by a number of ethnic groups whose population was found as below:

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Number of Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luhya</td>
<td>145</td>
</tr>
<tr>
<td>Kikuyu</td>
<td>24</td>
</tr>
<tr>
<td>Luo</td>
<td>7</td>
</tr>
<tr>
<td>Kamba</td>
<td>1</td>
</tr>
<tr>
<td>Kisii</td>
<td>1</td>
</tr>
<tr>
<td>Teso</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>179</strong></td>
</tr>
</tbody>
</table>

We had initially sought to interview half the population of the farmers in the scheme. This was on the basis of the number of plots as the assumption had been that each farmer owned just a single plot. Since this was never the case, we decided to interview farmers in one hundred plots, which thus was more than half the real farmers who own plots in the scheme (179).

We employed the method of stratified sampling to obtain our sample population in the scheme. The method allows the researcher to ensure that certain groups in the population are reflected proportionally in the sample (Herzon, and Hooper, 1976:15). As already seen, the population of farmers in the Nzoia scheme constitutes of various ethnic groups, on whom the research is based. Hence for each of the strata formed by ethnicity to have a proportional
reflection of the sample, they have to be sampled differently on their own basis.

Since each household farm had a plot number, these were used to select a sample through the mechanism of raffling, with the replacement of the already selected members. This ensured that each member (plot number) selected had an equal original probability of selection into the sample. We recorded plot numbers on small slips of papers, for each ethnic group separately. These slips of papers were then folded up and raffled thoroughly in a basin every time a new selection was made. Thus the folded paper slips were randomly picked from the basin, for which the plot number was recorded only once. Whenever the same number was picked for the second time, it was not recorded in the sample. In this case the sum of the samples obtained from each ethnic group formed our grand sample of the total population in the scheme that we sought to interview. We thus interviewed half of the population of each ethnic group. However, since some ethnic groups had only one farmer, he had to be interviewed as a whole, population. Additionally, those farmers who were found to have combined more than one plot were represented in the sample only once. In this case, once any plot number of the combined or owned farms appeared in the sample, the rest of the plots owned by the same farmer automatically lost their chances of selection into the sample. This was aimed at providing greater chances to interview other farmers who had just single plots in the scheme.
3.3 The Limitations of the Study:

It was realized that our questionnaire was long and took well over three quarters of an hour on average. This was in addition to other times spent with the farmers for direct observation of other dairy farming components, such as the quality and conditions of the dairy animals a farmer kept, the availability of any established artificial pastures, milking sheds, watering places and dipping facilities, among others. This was even further compounded by the fact that some farmers tended to over explain what to us were obvious questions. For instance, when asked to comment about their rating of the local co-operative management, there was evidenced a lot of subjective rationalisation, probably due to some personal differences with either the former or current office bearers, some of the complainants who had made fruitless attempts to be elected officials to the co-operative at one time or another. To some extent therefore, such people had already formed negative opinions or reactions as far as their personal observations were concerned, a factor probably reminiscent in the mass-exodus or boycott of the co-operative society as a channel for selling milk and other agricultural produce.

The responses from farmers were also diverse. While the majority of the average farmers interviewed about their opinions on various aspects of the research provided both problems and expected solutions, among others, it was realised that some farmers relatively doing
problems. It was not surprising to note that some thought it was simply the question of the government knowing their plight and thus expected to also provide such solutions. It was thus felt necessary to probe further the respondents on specifically what they thought and/or expected the government should do. We believed that by so doing such farmers would in future be more enlightened about their problems and provide or make an attempt at their solving. For example the belief was that such farmers would in future be able to seek the help of the extension service and other development agencies, such as in the more effective utilization of loans in farming enterprises. They would no longer be assumed in that category which waits for the extension service (government) to realize their problems and come to their farms.

The study period for our research had also coincided with the scheme's harvesting time, meaning most of the respondents could never easily be reached for interview. Initially an attempt was made to help in the harvesting work for sometime, during which period general discussions on farming were made. This was never quite successful in most times as some farmers were still reluctant to 'waste' an hour for the interview, due to the long questionnaire. Therefore we sought refuge in undertaking the research as from the afternoons for those farmers found busy in the mornings. This had meant having to travel from one end of the scheme to another to establish whether the farmer scheduled for interview was free or not. In the process, valuable time was definitely lost, in some instances compelling
before we could procure an interview with him.

In an attempt to minimise the amount of time lost generally, most of the morning periods and those times a farmer was busy, were used in the observation of other dairy farming components, such as established pastures, milking sheds and watering points. This undertaking no doubt reduced the average time spent with each farmer on such discussion, without necessarily always having to move to every part of the farm again.

A few household heads were working class, engaged in teaching or other private and public service professions. Such were never easily available over most week days, and hence could only be available over the weekends. Here was another problem as it was during such days that they also most likely worked on their farms. In some instances, we resorted to "instant confrontations" at whatever times or places (market centres/schools) for interviews, such as over lunch times or free periods in schools, or during their social times. But this was only done usually after the other observation requirements had been done, to make a more effective and smooth discussion.

There were a few cases of those respondents working far from the scheme. We made an attempt to write them to arrange an interview at their own convenience. This method was not quite successful, as most never replied. We were compelled to make frequent visits to
their plots on most weekends or through information that they were available.

It had also turned out that most of our respondents were male spouses. We had initially proposed to interview the heads of households who made the major decisions as related to the various aspects on dairy farming on the farm. In some cases, we had realised quite some contradictions in the farm's decision making process. In most cases there were indications of joint decision making, but some female spouses were less willing to be interviewed lest they find problems with their male counterparts. A possible inference here appeared that such 'discussions' and decisions were only after the male spouse had made up his mind about what to undertake. Any discussions made could simply occur in the form of informing the female spouse on what was yet to take place. Otherwise our research period could have taken a more relatively shorter period had we to interview more of the female respondents as they appeared more easily available on the farms in most cases. May be this would have provided more balanced responses from a greater proportion of women to men in their understanding of problems inherent in farming and their likely solutions. There were for instance some cases of male spouses who responded positively to the availability of such services as A.I., but when probed further were found not to be quite knowledgeable about the punctuality and reliability of such services. It had been found that such farmers relied on their workmen in most times, as were usually away during the weekdays working. There was one or so cases
who even consulted their workmen during the interview to ascertain on certain aspects of services.

The most explosive and sensitive part of our research centred around incomes. Apart from the more steady produce from maize and milk production, it was never easy getting the rightful income figures accruing to the farmers who had businesses or other sources of incomes such as tractors, grinding mills, shops, bars and restaurants, among others. We had thus to resort to making rough estimations, depending on the kind of businesses, of the incomes one gets. This had been complicated from the fact that interviews about income receipts leave a lot of suspicion on the part of the respondents as to the real motives of the study research. In cases where we highly doubted what a respondent gave as his income levels, we resorted to use of indirect methods to obtain these figures. This involved the use of subordinate staff, through 'inducement' of course, who were managers, cashiers to such businesses. There is no way we can however guarantee that even these were the true income levels. However, there were a few instances where we realised some divergence in income when we employed this method, such as in the matatu operation. However, it has to be underscored that the concern really was not to obtain the actual income amounts received, rather we were concerned about the proposition that a substantial income resource was a vital component in the development of dairy farming on a farmer's plot. For instance, while some farmers had complained of frequent disease emergence for their cattle, and in most times
without immediate forthcoming cash to purchase the drugs (such as for the dreaded East Coast Fever costing well over Ksh. 500/- per small bottle), reliably it was believed a farmer with a chain of businesses was in a better position to offset such an emergency. This was likely to ensure not only a more healthy grade dairy herd but also one with a sound income source.

We were unable also to compute such incomes related to seasonal activities, such as for those involved in selling of agricultural produce as middlemen, and livestock dealers, among other, who only come in the business limelight during harvesting or when schools open and the affected parents have to obtain cash for fees. Despite our realisation that such middlemen in agricultural produce could be doing quite a lucrative business, it was never easy to compute income levels involved due to its seasonality. On the same note, some respondents were unwilling to record this as a business undertaking since it is not a full-time undertaking for which they could tie a particular income average within some concrete specific time period. In the final analysis, we had no option but rather to overlook this in analysing the income quantities to a farmer.

3.4 Data Collection Methods:

We basically employed the interview method using the questionnaire...
to obtain the relevant information needed from the respondents.

The questionnaire comprised of both the 'closed' and 'open-ended' questions. The use of participant observation was also supplementary, especially in cross-checking on the quality of livestock, quality of management such as pasture, and related dairy structures development, such as fencing, milking parlours or sheds; and the farmer's own experiences in dairy farming in terms of his own management capacities and consciousness for dairy farming development.

During the course of the study, there were certain variables which needed special attention in the methodology required to obtain the required information. This was mainly in areas of incomes accruing to the respondents, and the quality of their management in the field of dairy farming. For the latter consideration we formed our own indicators which we used to suit the scope of this study. We first discuss the former, thus the methodology around the way we arrived at incomes to a respondent.

The initial study aim was to get information from almost all likely sources of income. This was to be from all farm enterprises which the respondents engaged into and from which some or all the produce was sold for cash. The focus was also to be on off-farm income earning activities, such as running business shops, butcheries, public service vehicles, property rents, wages and salaries to the respondent. As relates to farm enterprises, it was found that the only stable activities were the production of maize and milk. In
this case they were the only activities engaged in year in, year 
out, whether singly or doubly. Other farm activities such as 
production of sunflower, beans, potatoes, groundnuts, were those 
either not frequently engaged in or simply used for subsistence 
purposes. It was difficult to compute their incomes in this case, 
and hence their contributions to the total income was side-stepped. 
We thus computed farm activities incomes from maize and milk 
production only. Coffee production was another farm enterprise engaged 
in by some farmers. However, this is a recent introduction in the 
scheme, in the last about five years, and whose marketing is not 
well established yet, in terms of the completion of the processing 
factory in the scheme region. In any case, the farmers with some 
coffee plantations had rarely made any harvests for sale to provide 
them with a significant income. It was also not considered.

The focus of our analysis was in a five year period, in this 
case from early 1980's to the close of 1986. We never recorded the 
yield for 1987 because our research was done from July the same year 
and for which we could not obtain the yield for maize as had not 
been harvested and marketed. Milk yield production for the same 
year was also ignored for the purposes of arriving at a more 
favourable average of the annual agricultural enterprises income. 
For the period in question, thus five years focus, we recorded 
the lowest and highest yield ever reached by a farmer in maize 
and milk production on the farm. The corresponding incomes were 
computed on the same basis, respectively. This thus gave us the highest
ever annual income and the lowest income ever attained by the farmer.

The statistics for the computation of the income depended largely on the respondent's own memory as much as possible about the highest yield ever marketed. This was in terms of the number of maize bags sold and the number of milk kilogrammes or gallons delivered to the collection centre for processing. In cases where there were doubts, we asked in terms of which year the respondent had either a crop failure or the best yield or whether there had been any problems associated with drought, in the years in question. For milk production, an attempt was made to cross-check the total yield delivered for sale by inquiring about the volume of delivery vessels used or whether they ever borrowed from other neighbouring farmers. We also used milk record cards or payment slips for some farmers who kept them, particularly for the latter as was case with those who delivered straight to the Kenya Creameries Co-operative (K.C.C.). This had also aided us to get the amount of cash paid per kilogramme of milk delivered. For those who delivered to the local co-operative society, the amount of cash paid was obtained there.

The total amount of cash earned from the total lowest and highest sales for maize produce was arrived at by multiplying by an average price of Ksh. 170.00. This was partly arrived at because within the same five year period we focused our attention,
farmers generally alleged that the price per bag of maize had fluctuated between Kshs. 158.00 and Ksh. 180.00. This was also verified from the local co-operative society which sometimes acts as a marketing channel for some farmers' maize and other smaller agricultural produce. On the other hand, it was noted that a number of farmers also had sold their maize to middlemen, whose purchase prices in many cases depended on mutual agreements with the individual farmers. This variation from year to year had thus compelt us to use an average figure for the purposes of our computations.

Unlike the case for maize whose income is computed at the end of the year, for milk production, we had first to compute monthly income. This was arrived at by first multiplying the total daily yield in kilograms by an average of thirty days in a month. This total was then multiplied by the price per kilogramme of milk, depending on whether a farmer delivered his milk directly to K.C.C. on his own, or through the local co-operative society. The corresponding payments for a kilogramme of milk supplied was found to be Ksh. 3.10 and Ksh. 2.10 respectively. The annual income was calculated by multiplying the total monthly income by twelve months in the year.

The proceeds from the two major agricultural activities were finally added together, in terms of the lowest ever registered maize income to the lowest milk income in the five year period. The same was done for the highest ever yields for the same activities. These
two computations gave us the lowest and highest grand incomes to have accrued to a farmer from the two major agricultural enterprises in the period time.

It is our confession here however that our statistics might only have been approximations and not necessarily actual quantity yields, and therefore total incomes also. This was due to dependence on the farmers mental capacities to remember and who were bound not to precisely remember or quote the desired figures. On the same note, it is our conviction to justify our figures as our initial proposition was not really aimed at getting the actual figures on the yields from the agricultural enterprises. Ours was an attempt at simply making an approximation of the levels of income to a farmer which was hypothesized to have a leaning towards capital investment in, our concern, dairy farming development at the farm level.

The other sources of incomes which accrued to the farmers were calculated from the occupational monthly incomes and other businesses such as shops, butcheries, matatu operation, tractors, grinding-mills, bars and restaurants owned by some farmers. This was necessarily separated from other agricultural enterprises incomes, more so monthly income from milk, because we wanted to note whether other additional sources of income to a farmer formed an integral component of financial investment in dairy farming or not. An attempt to establish actual and precise financial outlays from milk and maize production were never forthcoming as generally farmers never made record of
these financial avenues. However, going by the general numerous complaints from farmers about numerous cattle diseases and the equally expensive cattle drugs, one could only assume that a farmer with a more steady and sound income source would be in a more safer position to offset such emergencies with greater success.

The kind of off-farm business which the farmers in the Nzoia scheme were found to engage into included operations of shops, butcheries, matatus, tractors, grinding-mills, bars and restaurants. Some of the farmers were found to own a combination of these businesses. For the case of matatu operation, to estimate the likely income accruing to a farmer daily, he was first asked to state the vehicle capacity. Then on the whole whether in most times he operates at full, half or far below capacity on most days. We also sought to know how far the destination was that the operator plied, such as between two major towns etc, which could tell us the likely amount of fare he charged to passengers. It was believed that in this light we could attempt an estimation of the likely daily income to the operator. This was never easy, for the single matatu operator was less willing to quote the actual income daily ranges, only giving vague answers as sometimes doing good business. Despite this, we estimated the daily average capacity of the matatu at half, allowing for recurrent expenditures by the owner and to take care of the carrying capacity ranges during good and bad business days. How we got around this complication will be discussed later in the problems encountered during the study, and
the alternative methodology employed to acquire the required information.

In relation to the shops/Canteen businesses, the operators were simply asked the average ranges of income they received per day, from which an average was then computed for this study. Our personal acquaintance with most of them was an added advantage in the process of the study as the shopkeepers had our confidence. However, the only limitation here was that the figures obtained were gross, not reflecting the real operations of the businesses.

The income earnings from bars were also obtained by asking the respondents to quote the average ranges of daily incomes on both bad and good days for their businesses. We made a further attempt to cross-check these initial figures through the employed subordinates who worked as cashiers or managers for the businesses in question. In additional we also tried to find out how many crates of beer or soda get ever sold.

However, in relation to those who owned butcheries, they were asked about the number of animals that were ever slaughtered in a week, and of what kind, thus whether cows, sheep or goats or pigs etc. We then asked the butchersmen about what range of costs of the animals they bought for slaughtering. This was critical because we realised the butchersmen registered their dissatisfaction at the levels of meat consumption in the area, and hence unlikely to over-invest. The average net profits which the respondents gave ranged between Ksh. 500 to Kshs. 800/= per slaughtered cow. The butchersmen
did not seem so keen on goat/sheep businesses due to market problems, and hence we excluded this altogether from income computation. For our purposes then, we calculated income profits at an average of Ksh. 600.00. This was multiplied by the average weekly animals slaughtered, by an average of thirty days to get a likely monthly income from the same. This was however, as already noted, only an attempt at estimating the likely income from such income sources, and which aid in dairy farming development on ones farm.

Those who owned tractors were asked to state the nature of contractual activities they engaged in. Such included farm ploughing, transportation, planting, maize shelling etc. For our case, there was one case of tractor ownership and who only engaged in farm ploughing for other farmers mainly. There were other farmers who owned tractors but which were only used for undertaking activities on the farmer's own plots. Those who ploughed for other farmers were asked to estimate the number of average farms they are ever hired to plough in any ploughing seasons in the last five years. An attempt was then made to establish the average sizes of the farms to determine the likely income levels in this case. Income would then be computed by multiplying the average number of farms the tractor owner ever ploughed, by the number of average farm acreage that were involved. This total was then multiplied by the average cost of ploughing an acre over the last five years. It should be noted, however, that such a source of income proved quite seasonal and hence its incidence on the overall total income might never depict a true picture throughout the year, dividing by twelve to get a monthly income.
The owner of a grinding mill was also, in the same light, asked to estimate the number of bags of maize ground in each day. This was then multiplied by the number of debes contained in a bag of maize, and then by the price charged per debe for grinding. The daily income was then computed for thirty days in a month. However, we only recorded half the total earnings, allowing for everyday expenditures on fuel, labour and repairs.

In general, it had to be noted that in all these cases, save for occupational monthly incomes, we were unable to come up with actual incomes to the businessmen in question. The best we did was to estimate the figures from the available information we had at our disposal, and which should be reliable for the purposes of our study.

The methodology around participant observation centred mainly on the individual respondents dairy farming management capacities and thus the quality of his herd. This related to the way an individual farmer was aware of the proper or basic methods involved in raising grade dairy animals. This was in terms of for example the ability to supplement natural grass with other cattle feeds, such as bran, salt lick, maclick, hay etc; how urgent he responded to animal health conditions by regularly purchasing cattle drugs for tick-borne diseases, for deworming; whether he had a good milking parlour or shed; planted pastures and following rotational techniques in the paddock system; close monitoring of animal health conditions and controlled breeding methods, thus at least mating of a grade bull
to a grade cow; and lastly, whether a farmer had animals that looked naturally healthy - not emaciated and/or bony. These indicators were constructed for our own purposes and understanding of this study, and need not necessarily be ideal. We categorised them into five major groups as follows:

(i) Cattle feeding - whether a farmer frequently bought supplementary feeds to animals, such as bran, salt-lick, maclick, hay and other concentrates to supplement natural pastures. We also looked at whether there were any planted artificial pastures such as nappier grass etc, and whether the grazing land was enough.

(ii) Availability of and/or good milking shed (or parlour), and with strict hygienic conditions followed.

(iii) Rotational techniques of grazing - whether these were strictly adhered to, with pasture lands divided into paddocks with fences.

(iv) Strictly controlled breeding procedures - here we looked at whether a farmer controls the kind of grade breeds on the farm, by for example breeding or mating grade to grade animals and not underbreeding (mating a Zebu bull to a grade cow or underbred bulls to grade cows). Here was also considered the animal population (stocking rate) in relation to the available pasturelands.
(v) Fast response to animal health conditions, such as the ability to mobilise financial resources to purchase drugs in good time for treatment emergencies to sick animals; frequent animal deworming - a requirement of once every three months. We also considered whether a farmer monitors individual animal production fluctuations or in cases where some animals are allowed to die of old-age because they are ones' pets'.

There were also five categories of management capacities responses designed for the farmers as follows:

(i) To a very great extent
(ii) To a great extent
(iii) To some extent
(iv) To a small extent
(v) To a very small extent

In this light a farmer who responded to the positive to all the five management routines outlined earlier was categorized as managing his dairy farming to a very great extent. A response to only four meant management to a great extent; a response to three meant to some extent; a response to only one or two meant to a small extent; while a response to none or where a farmer was found to be largely ignorant, such as lack of technical know-how in dairying, was rated as managing his dairy farming to a very small extent.
Initially, this analysis of the extent of dairy farming management was intended to be the farmers own personal consideration. It was however realised that this could not work just at face value like that, as some farmers were considering themselves good dairy farming managers while they were not. Hence the need to apply the indicators used, and also personal observations of some of the available conditions, such as animal breed quality. It had been on this premise that we also designed indicators used to denote the farmers animals breed condition, for which we had six categories as follows:-

(1) Very highly degenerated - This applied to the case where a farmer’s animals were bonny, unhealthy and for which he could never precisely name which animal breeds he had. Such also never made or showed any trace of breed to the researcher. In this case, we considered or had in mind the type of animal breeds which the farmers in the scheme were given when joining the scheme, such as friesian, Guernsey, Jersey, Aryshire and redpoll.

(2) Highly degenerated - This was case whereby the animals had been randomly bred, such as crossing friesian with jersey and also between grade and Zebu animals. Thus while it was possible to trace some breeds of older animals, it was not automatic for the more younger ones a farmer had on the farm. Such animals were also considered not quite healthy, too.
(3) Fairly degenerated - This applied to a farmer's animals with a healthy condition appearance, but whose breeds are mixed due to interbreeding (grade to different grade breed) and cross-breeding. To some extent, they showed characteristics of certain breeds recognisable.

(4) Degenerated - Here were animals which still maintained their original breed, but which showed trace of inadequate management on the side of the farmer due to inadequate feeding and general lack of adequate care.

(5) Breed maintained - was case where breeding, feeding and general management of animals was visibly of high standards. The animals appeared to maintain their original breed.

(6) Upgraded - This applied to cross-breeding of a grade bull to a Zebu dam only. Where the opposite had occurred (Zebu bull to grade dam) this was underbreeding leading to cattle grade degeneration. Cattle degeneration in these case applied to the change in the original breed of the animal due to for example inadequate management, wrong breeding procedures etc.
In this chapter an attempt is made to describe and make
inferences from the findings of the study. There will therefore be
two sections to it. The first deals with the general descriptions
of data findings. The other part of the chapter will centre around
purposive attempts at making statistical inferences about the data
at hand. In this latter case, we will strive to establish whether
there are certain characteristic relationships existent between the
various dependent and independent variables as used in each of the
hypotheses in the study.

4.1: The Descriptive Data Analysis:

The total population of the farmers in the Nzoia scheme was
found to be 179, though the whole scheme comprises a total of 200
plots. In this case, some farmers had actually owned or combined
more than one plot. A total of 100 farmers were sampled for interview
in the study. It was however largely the male population (90
farmers) that was interviewed, as compared to only 10 female
respondents. The criteria for the choice of respondents depended
on who was the head of the household, and in relation to the decision
making pattern on the farm. In this case, seven of the ten female
respondents interviewed were household heads by virtue of being widows.
The other three were largely responsible for a great deal of day-to
day farm decisions either because their husbands were engaged elsewhere.
with off-farm businesses, or just never cared much about the farm.

4.1.1: The levels of income to farmers and possible investment in dairy farming development

The study reveals that most farmers studied in the scheme do not appear to engage in other off-farm income earning activities, apart from a few in the formal employment. This is shown in the table below. There were nine farmers (respondents) who apart from owning the farm were also primary school teachers. Nine others were self-employed in such businesses as shops or canteens, butcheries, bars and restaurants, and matatu operation. Fourteen farmers did farming and engaged in other various means of earning more income, such as wage labour in trades such as masonry or other contractual dealings. However, a substantial number of respondents (68) engaged only in farming to earn their livelihood.

Table 1: Occupations of respondents:

<table>
<thead>
<tr>
<th>Type of Occupation</th>
<th>No. of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer/teacher</td>
<td>9</td>
</tr>
<tr>
<td>Farmer/self-employed</td>
<td>9</td>
</tr>
<tr>
<td>Farmer/Farmer/housewife</td>
<td>68</td>
</tr>
<tr>
<td>Farmer/other occupations</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
It is not easy to make a positive conclusion that the majority who do farming alone are content with, and get, such incomes as to satisfy all their financial needs. There could be two sides to this consideration. As Pollard (1981: 567) observed also, the off-farm income could be a major provider of investment funds in farming; but on the other hand, high non-farm income may merely indicate the neglect of the farm. Likewise, some non-farm occupations could comparatively be less productive, in terms of the proceeds. For instance, of the 30 farmers who received some monthly income in one way or another, nineteen (or 63.3%) received incomes ranging from as low as Kshs. 500 - 2,000/=.

On the other hand, it was found that 25 of the 30 farmers (83.3%) actually received incomes that were below the average of all the farmers who made some monthly income (Ksh. 7,456/= average). This shows that they were receiving quite low incomes in such occupations providing them a monthly income. It is possible that such farmers may tend not to recognise that dairy farming requires their full time energies; rather they may be filled with notions that farm income is 'unreliable', and thus the need for a 'survivalist income', despite the low rates of renumerations in such opportunities as primary school teaching. Pollard (1981:580) found this tendency also. The situation as depicted in the case of the Nzoia scheme tends to discount our supposition that additional income is a crucial source of income investment in dairy farming development at the individual farm level.
As was the case with the high variations in the levels of occupational monthly incomes, the same is explicit with farm incomes. These were categorised as yearly incomes, as most agricultural activities engaged into by farmers in the scheme yielded income by the end of the year. Farmers were asked about the lowest and highest yearly incomes they had ever received in the period of the last five years before the study.

In the lowest yearly income category, a farmer who reported the lowest income had received Kshs. 3,400/= while the farmer who received the highest (of this lowest yearly income) reported Kshs. 99,780/=. Here, the average income was found to be Ksh. 32,643/=.

For the farmers studied, there is definitely high income disparities, given the range of Kshs. 96,380/=. ..

On the other hand, this same trend is visualised in the category of the highest yearly income reported by the farmers. The lowest income here (and what is supposed to be his highest ever income earned in a year in the last five years) was Kshs. 11,900/=. The highest income reported here was Kshs. 294,060/=. This gave a range of Kshs. 282,160/=. As was seen above, the minimum income received in this case is also far below the average income (Kshs. 51,027/=). These findings are quite in accord with earlier observations by Clough (1968:106) and Clayton (1983:48). The latter had concluded that such variations in income on the farm were due to the differences in farm family characteristics such as size, ability and energies expended.
in the farm, among others. This variability in the Nzoia scheme may be explained in a number of ways, but largely in the number of acres (farm size?) a farmer has set aside, for our case, for what he considers a major activity on the farm. This realisation should also therefore shed light on the degrees of innovativeness amongst the farmers.

There were only six farmers in the scheme who had made attempts to obtain dairy farming development loans. These ranged from Kshs. 20,000/= to Kshs. 50,000/=. Three of the six loanees actually received the loans in cash form, while one received the loan in form of dairy cows and grass seed for pasture development. The other two received it in form of dairy cows. In a way, it is interesting to note the quite low rates of loan use in dairy farming development. One possibility is that the farmers are self-sufficient and can finance their dairy farming development from their overall farm or off-farm incomes, and hence they are less inclined to seek for such loans. On the other hand since some farmers had reported the fear they have about the reliability of dairy farming, it may simply be a question of risk aversion.

From just these few six cases, two farmers were unsuccessful with the loan as the animals actually died before any gains. They reported never to have followed it up to take another loan because, as one reported, the loan was quite a disappointment. The other one has yet to complete payment of the previous loan. The other four
farmers benefited from the loan to a large extent, in addition to having an increase in milk supply. Two of the successful loanees were able to build themselves a permanent house. Of the remaining two who made gains in the loan, one was able to pay all the farm loan and was in a much better financial position, apart from building himself a house. The remaining farmer also paid farm loan and is in a much better financial position than before the loan.

Apart from one farmer who used some off-farm income to re-pay the dairy farming loan, the other five squared it through milk production sales and other agricultural production activities. This shows that given the opportunity, most farmers in this scheme are in a favourable position to make a lot of development through the credit facilities, and be able to finance loan repayments from farm activities.

On the other hand, the situation may not be that real. A look at the repayment capacities of farmers of the initial farm loan - (one which went into the purchase of the former white highlands, and other initial capital investment such as fencing material, dairy farming equipment etc) - is not encouraging. Slightly over twenty years, on average, since farmers joined the scheme, only thirty farmers had completed repayment of such loan. The other seventy farmers studied approximated the amount of loan remaining ranging from Kshs. 4,000/= to 40,000/= . On the average, each farmer has about Kshs. 12,000/= to complete the payment.
In an earlier study on settlement schemes in the former white highlands, Clough (1968:56) found the same problems with repayment of the loans on time. For the small scale farming schemes, this was then attributed to very low incomes that it would not have been easy for the farmers to repay their loan instalments to the department of settlement. That such incomes were only sufficient to provide them with reasonable levels of living; and that the farmers studied never made a cash income which even approximated or approached the target levels set by the settlement planners.

As we had seen earlier, the levels of income in the Nzoia scheme for some farmers are relatively too low, and highly variable. This might be one reason why about three quarters of the farmers in the scheme have never been able to offset their farm loans. The income levels might just be on such scales that they are only sufficient to augment the subsistence financial obligations with almost none left to substantially go into the loan repayment. Such farmers may not just be putting more energies in their farming, and thus not good entrepreneurs. This in a way also means there is continually low finances available for possible investment in general farming, and dairy development, in our case. This is even coupled with the high number of dependants (14) reported by respondents, on the average. The farmers interviewed reported all sorts of help to such dependents, from financial aid, providing them with a piece of land for them to farm independently, to provision of all subsistence needs.
Gwyer (1972:5) writes that Clayton (1970:440) saw that the programmes crop intensification and land registration in small scale agriculture had succeeded in increasing its employment capacities as they lead to an increase in commercialized agriculture. The observation was that employment increased because farmers become more better-off and thus withdraw into entrepreneurial role and employ others to help them on the farm. That crops such as tea, coffee, and pyrethrum generally have higher labour requirements per acre than food crops like maize and beans. That the purchase and application of material inputs by farmers not only raises the crop-output, but also increases labour demand; and that use of material inputs such as fertilizers and insecticides, through raising crop yields increases labour demand not only at harvest times, but raises marginal productivity of labour in such operations as weeding.

Odingo (1966:148) had however earlier expressed his pessimism at how some rural programmes in agriculture could help alleviate the unemployment problems through land settlement in the Kenya Highlands. The problem had been that the majority of the High-Density Schemes were designed to use family labour. As a consequence, this had little provision for employed labour. The Nzoia scheme differs from the above schemes, in that it falls in the Low-Density Settlement schemes. It is relatively about double the acreage of High-Density schemes. The picture presented on employment in this scheme seems rather gloomy. The study reveals that there were a total of forty-one farmers who had not employed any labour in the
last five years, in the dairying enterprise, before the study. There were other fifty farmers who only reported an average of one employee. Six farmers had had two employees and only one had an average of four employees. The tables 2 and 3 below show more clearly the employment situation.

Table 2: Volume of labour used in dairy farming in the Nzoia scheme:

<table>
<thead>
<tr>
<th>Volume of Labour</th>
<th>No. of Farmers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3: Volume of labour used in other farm activities:

<table>
<thead>
<tr>
<th>Volume of Labour</th>
<th>No. of Farmers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>73</td>
<td>73</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 3 above shows even a more disappointing picture in relation to total labour used by individual farmers. The majority of the farmers thus reported having had no employed labour in the scheme in the same period. Only a small minority (20%) had an average of one. The other 7% had between 2-4 workers. These figures took into consideration those workers paid on a monthly basis as considered permanent.

Although Gwyer (1972:5) depicted a rather encouraging occurrence in terms of increased rural agricultural employment possibilities, he hastened to add that the trend may be curtailed by cash shortages at the time of application, since many demands of the farm households especially school fees have exhausted all receipts from the previous seasons crop. That cash shortages may also preclude the hiring of labour to meet the seasonal peaks. We have no doubt that the low rates of permanent labour employment in the Nzoia scheme is affected by the same conditions, especially the large number of dependents reported per household. In the same light, there was not much concrete evidence that farmers used casual labour whenever farming activities demanded. The only possible conclusion would then be that most farmers resort to their 'dependents' labour reserve, for what they could have hired for cash, and especially given the overall low incomes for a large proportion of the farmers.

That there is an intrinsic problem of low income levels to most farmers in the scheme can be reflected in the levels of labour
cost those farmers who employed labour actually offered. The maximum total average cost of labour ever paid in the five year period was Kshs. 2,500/= by a single farmer, per month. The minimum ever paid was Kshs. 80/= to a herds boy. A total majority of farmers (28) reported paying an average labour cost of Kshs. 245/=.

In short therefore, our conclusion from the foregoing discussions reveal that the lesser investments in labour in agricultural activities, and dairy farming in particular, maybe due to the low levels of incomes earned by the majority of the farmers in the scheme. The findings on dairy farming development investment in the scheme show that there is a significant association between having additional income sources, and the tendency to make investments in dairy farming development. The contingency coefficient is 0.61299, with 35 degrees of freedom. These findings contradict those of Pollard (1981:580). However, in our case, the contradiction may result from the fact that there were very few farmers who ever had any other sources of off-farm incomes in the scheme.

Note: Most of the contingency tables in this study have most cells with less than five cases. This occurrence invalidates the discussion of the chi-square.
Table 4: The relationship between occupation and types of dairy farming investments:

<table>
<thead>
<tr>
<th>OCCUPATION TYPES</th>
<th>PREFERRED DAIRY INVESTMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NONE</td>
</tr>
<tr>
<td>FARMER/TEACHER</td>
<td>5</td>
</tr>
<tr>
<td>FARMER/HOUSEWIFE</td>
<td>8</td>
</tr>
<tr>
<td>FARMER/SELF EMPLOYED</td>
<td>0</td>
</tr>
<tr>
<td>FARMER</td>
<td>23</td>
</tr>
<tr>
<td>FARMER/OTHER</td>
<td>6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>42</td>
</tr>
</tbody>
</table>
In addition, the findings also indicate that the type of occupation reported by the farmers is also associated with investments in dairy farming development. This is shown by a contingency coefficient of 0.49627, with 28 degrees of freedom (see table 4 above).

On the whole there were 58 farmers who made some investments in dairy farming development in one field or another. Some farmers had reportedly made substantial gains as a result of such ventures. Twenty-seven farmers reported having generally increased their milk quantity levels, and thus an added higher income from dairy farming. Nineteen farmers reported, in addition to gains above, having been able to acquire other development loans in arable farming from the guarantee of repayment through milk sales. Seven farmers were able to build themselves permanent houses, acquired other farm development loans, and had produced larger milk quantities, and thus higher incomes also. Two other farmers were able to acquire other farm development loans; one farmer made gains in all the reported gains above; while another built himself a permanent house and acquired other farm development loans.

In general therefore, almost all of the farmers who made some dairy farming investments on their own gained from the same. This might be the explanation for most of the interviewed farmers willing to make even more investments in milk production were the prices of milk to be increased. Twenty-one farmers saw that investing more
would result in higher returns and a more steady monthly income from milk production. Twelve farmers foresaw a steady monthly income; while eleven others aimed at generating more income from milk production. Another eleven wanted to generate a more steady income monthly; Nine farmers hoped to generate more income and therefore higher returns; while seven farmers aimed simply at higher returns in milk production (see table 5 below).

Table 5: Contemplative reasons for willingness to invest more in milk production:

<table>
<thead>
<tr>
<th>Reasons</th>
<th>No. of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher returns and more steady monthly income</td>
<td>21</td>
</tr>
<tr>
<td>Steady monthly income</td>
<td>12</td>
</tr>
<tr>
<td>Generate more income from milk</td>
<td>11</td>
</tr>
<tr>
<td>Generate a more steady monthly income</td>
<td>11</td>
</tr>
<tr>
<td>Generate more income from milk and thus higher returns</td>
<td>9</td>
</tr>
<tr>
<td>Generally higher returns from milk production</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>71</strong></td>
</tr>
</tbody>
</table>

However, with lower or reduced milk prices, there were thirty-four farmers who could not foresee themselves sacrificing more investments in milk production. This was due to the lack of
additional funds to channel in the dairying enterprise (14 farmers). Four farmers had no qualified workers to enable them stake more in dairy investments (as the farmers themselves were not always available full-time on the farms); while one farmer had no qualified worker nor additional funds. Three farmers were scared of the reported frequent cattle deaths; two farmers could only make more investments in a paying enterprise. While another two reported having inadequate land. Five farmers lacked additional development funds and were also scared of cattle deaths; while three farmers reported that to them animals were 'God-given', and hence could not reduce them whether milk prices tumbled. (see table 6 below).

Table 6: Inhibitive circumstances against more investment in milk production with lower milk prices:

<table>
<thead>
<tr>
<th>Reasons</th>
<th>No. of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of additional development funds</td>
<td>14</td>
</tr>
<tr>
<td>Non-availability (lack) of qualified workers</td>
<td>4</td>
</tr>
<tr>
<td>Lack of funds and no qualified workers</td>
<td>1</td>
</tr>
<tr>
<td>Scare of frequent cattle deaths</td>
<td>3</td>
</tr>
<tr>
<td>Can only invest in a paying enterprise</td>
<td>2</td>
</tr>
<tr>
<td>Inadequate land</td>
<td>2</td>
</tr>
<tr>
<td>Lack of funds and scare of cattle deaths</td>
<td>5</td>
</tr>
<tr>
<td>Animals 'God-given'</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>34</strong></td>
</tr>
</tbody>
</table>
4.1.2: The nature of extension services and their influence on the farmers' performance in the scheme:

The tables 7 and 8 below show the ages and educational standards of the farmers interviewed in the scheme.

Table 7: Farmers' age distribution:

<table>
<thead>
<tr>
<th>Age Category</th>
<th>No. of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto 50</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>50 - 59</td>
<td>54</td>
<td>54</td>
</tr>
<tr>
<td>Above 59</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

The respondents' ages ranged from 31-86 years, with a mean of 54 and a mode of 50 years. As the table above shows, most farmers are actually in their late ages. This is to be expected because most should have joined the scheme (between 1966-69) when they were in their late twenties or early thirties in age. The more younger respondents are more likely to be the children of original farmers who were registered for the farms when the scheme was being opened for settlement.

Most of the respondents and their spouses as shown in table 8 had at least attained the basic primary education, though there are
variations by sex. The number of male respondents was 93 because seven female respondents were widowed and hence their dead husbands educational levels were not recorded. This table shows that of the 93 male spouses, only 5 had never had any schooling, as compared to 24 female spouses. However, more women had had up to standard four level of education, compared to 27 males; and 28 and 19 respectively for education levels up to standard eight. It is however shown that males attained higher educational levels (42) of form two and above, compared to 16 females. This might be explained from the fact that in the olden days, most women never achieved higher levels of schooling, if ever they went to school, and more so as the ages of the farmers are mostly beyond 50 in the Nzoia scheme (see table 4).

Table 8: Levels of (respondents) educational Standards by Sex:

<table>
<thead>
<tr>
<th>Educational Standards</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>5</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>Upto Std 4</td>
<td>27</td>
<td>32</td>
<td>59</td>
</tr>
<tr>
<td>Upto Std 8</td>
<td>19</td>
<td>28</td>
<td>47</td>
</tr>
<tr>
<td>Form two and above</td>
<td>42</td>
<td>16</td>
<td>58</td>
</tr>
<tr>
<td>Total</td>
<td>93</td>
<td>100</td>
<td>193</td>
</tr>
</tbody>
</table>

George and Chokshi (1977:7) had concluded that age and levels of education of farmers had an influence on the farmers' performance and
the nature of the animals kept. Since most decision makers on the farms in this study were found to be male, then our tentative observation should be that use of extension information should likely be higher, and performance too. The assumption is that educational levels, and therefore modernity, have a bearing on the likely innovativeness degrees of individual farmers, in liaison with the extension advise.

Over half of the interviewed farmers (54) in the Nzoia scheme reported never to have had any prior dairy farming knowledge when they joined the scheme. The remaining 46 had various explanations to their previous encounters with some form of milk production experiences. Thirty-nine reported having had such in their previous home areas, having mainly centred around the local Zebu breeds. Even though, such production was never done on commercial lines, rather mainly for the subsistence in the household. Thus a total of 93 farmers interviewed reported never to have been marketing their milk exclusively for the purposes of cash incomes. Other farmers with milk production knowledge reported having had prior training in either schools or colleges (4 farmers), through attending the National Agricultural shows, listening to radio agricultural programmes and reading related newspapers (1); and two others had either had prior training, visiting agricultural shows or listening to radio agricultural programmes and reading agricultural newspapers.
However, it had been the Kenya government's objective that all farmers undergo some kind of inductive courses at farmers training colleges (F.T.C.s) (such as Lugari F.T.C. in the region) in dairy farming before or immediately they joined the scheme. In the course of the interviews with the farmers, we found that some had never attended such courses. For instance some reported having only sent a workman or any other relation, and some of whom were never any more staying on the farms at the time of the interview. As Pollard (1981:579) also found, all the farmers in the Waller Field (scheme) in Trinidad were expected to have attended some dairy course prior to entry into the scheme. But about 15% of them reported never to have attended even the induction courses. This was attributed to likely take over of farming operation by wives of the original plot recipients upon death or separation from their husbands or upon his leaving the farm for alternative work elsewhere.

George and Chokshi (1977:88) concluded that for farmers to use the help of development agencies (and/or other extension services), they should be aware of some of the relevant facilities. The task of making farmers more knowledgeable about such services largely rests with the extension services personnel and the related media of communication (Refugio, 1972: ). Chitere (1976:44) also observed the greater need for extension education for both the farmers and junior extension officers. That most problems faced by farmers revolve around lack of know-how, particularly in the more complicated dairy farming development and related routine operations. These
observations tend towards our supposition that the degree of extension service input can have a leaning towards an increase in farm productivity by individual farmers. But Chitere (1980:47) saw that the extension efforts of educating farmers, and provision of support services, get influenced by two factors - the process of communication of the information to the farmers, and, secondly, the strategies employed in contacting and involving rural farm families in agricultural programmes.

The findings from the Nzoia scheme show that all farmers interviewed were actually knowledgeable about the existence of the extension services. Such included agricultural officers, veterinary and community development officers. The majority reported, however, knowledge of only the first two officers (88 farmers).

The farmers were asked to state the number of times they had been visited by any of the extension personnel in particular time periods. There were only six farmers who reported having been visited once in the last week prior to the interviews with them. In the last one month prior to interview, sixteen farmers had been visited once; while in the last three months, fifteen farmers had been visited once, and two farmers had been visited twice. In the last six months, fourteen farmers had been visited just once; two farmers had been visited twice and one farmer reported a record six times of visitations. In the last five years, twenty-four farmers had been visited once; five farmers had been visited twice; two
farmers had been visited thrice, and one farmer had been visited eight times.

Although we depended largely on the farmers' own memory whether they had been visited by the extension personnel at any one time, the findings here reveal very low extension service work in the scheme. These findings are in accord with an earlier observation by Roling et al. (1973) who noted that the individual farm visits method is widely used by agricultural field workers in this country (Kenya). The author however concluded that the number of farm visits made by junior extension workers is very low (Chitere, 1980:49). It has also been noted that other methods used by the extension services to educate farmers included recruiting the latter for courses, demonstrations, briefing on new development in farming at barazas and co-operative society meetings. That those owning radios may listen to broadcasts, or may also read agricultural newspapers or obtain information about improved farming from neighbours and other knowledgeable persons in farming communities (Chitere, 1980:49).

However, the findings about these other methods of educating farmers were no better placed in the scheme. There were only forty-two farmers who reported attendance of barazas at one time or another, many of which were largely administrative oriented. This is why even most of those farmers who reported no attendance indicated that such programmes in farming are no longer seriously organized in the scheme. There were even fewer farmers who ever read agricultural
and related informational newspapers (20 farmers). The realisation was that the farmers were ignorant about the existence of such newspapers, more so when probed to mention their particular names and their scope (see table 9 below). The highest readership was reported for the farmers' voice agricultural newspaper, for which eleven farmers reported reading.

Table 9: Agricultural newspaper readership by farmers:

<table>
<thead>
<tr>
<th>Type of newspaper</th>
<th>No. of farmers</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers' voice</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Kenya Farmer, Coffee Bulletin,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers' voice</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Farmers' voice; Kenya Farmer</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Kenya Farmer</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Coffee Bulletin; Farmers Voice</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Kenya Farmer; Coffee Bulletin</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Farmers' not reading</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

On the radio media broadcasts, there were 47 farmers who reported listening to the agricultural radio programmes. Those who reported not listening either never owned radios then or such programmes were broadcast when they were always away. Even for some of those who indicated listening to the programmes, it was realised this was sometimes only coincidental. This was reflected in the farmers limited knowledge of particular times such were broadcast.
or particular aspects of farming they dealt with.

A total of 72 farmers had attended some National Agricultural shows held annually in various towns of Kenya at different times of the year. However, only 61 farmers indicated they had some gainful knowledge in dairy farming development. It should be made clear, however, that the large number of reported farmers having attended agricultural shows was due to the fact that the farmers were asked as to whether they had ever visited any agricultural show ever since joining the scheme. Table 10 below shows the usage of such media of agricultural information by farmers in the scheme. It should also be noted that there was a lot of overlap in the usage of these media by farmers, hence totals more than 100.

Table 10: Types of media of agricultural information used by farmers.

<table>
<thead>
<tr>
<th>Media type</th>
<th>No. of farmers</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural shows</td>
<td>72</td>
<td>38.5</td>
</tr>
<tr>
<td>Newspapers</td>
<td>20</td>
<td>10.6</td>
</tr>
<tr>
<td>Radio programmes</td>
<td>53</td>
<td>28.3</td>
</tr>
<tr>
<td>Barazas attendance</td>
<td>42</td>
<td>22.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>187</strong></td>
<td><strong>99.8</strong></td>
</tr>
</tbody>
</table>

The individual farm extension visits were highly skewed towards the general arable agricultural farming. The only major strides towards
dairy farming actually involved the treatment of sick cattle by the veterinary officers, reported by 22 farmers. Twenty other farmers reported such visits as only having been routine work, which in most cases involved mere observations of the crops on the farm by the extension field officers. Twenty three other farmers reported visitations for routine work and other types of jobs done by the extension service, such as when a farmer wanted to establish a coffee plantation and needed the advice and directing by the field officers. There were 6 other farmers who reported being visited for the purposes of treatment of sick cows and other types of extension advice; 5 other farmers were visited for treatment of sick animals, routine work and other extension advice; one farmer reported being visited to make a farm plot demonstration (on techniques of maize planting), treatment of sick animals and other types of extension work; while one farmer had reported being visited for routine work and dairy farming advice. In this last case, the farmer reported being advised to burn down the marshes on the farm to reduce the incidence of ticks on the farm.

In general, there was very little dairy farming development extension advice. There were only six farmers who reported having been visited specifically for some dairy farming work. Two farmers were advised on dairy farming grazing methods; two others on the general dairy farming management, such as need to spray animals on the farm and bush clearing to reduce tse-tse flies; one farmer was given advice on how to feed milk to calves; while another farmer was
advised to spray his animals one more time on the farm as there were too many ticks on it.

In emphasizing the need for increased dairy farming advice from the extension service, Chitere (1976:45) observed that the enterprise entails a whole series of practices, such as correct milking (times) and milk handling practices, pasture establishment and utilization etc, each needing particular knowledge and skills. It may perhaps be possible that the inadequacy of such an extension service may be the undoing for better dairy farming development at the individual farm level for some farmers. This inadequacy is further exemplified in the nature of extension discussions the farmers reported having ever held with the extension field officers. In the five year period as the focus of our study, the majority of the farmers (31) held discussion on coffee establishment on their farms. This is a recent establishment in the scheme and appears to have attracted the attention of the extension service more than dairy farming in the scheme established much earlier. The assumption could be that dairy farming must have been adopted and integrated by the farmers by now, but it may be interesting to find completely a different situation for a large majority of the farmers in the scheme.

There were other 11 farmers who had been visited but who never made any discussions with the extension field officers. Four others reported just being directed on what to do, depending on the problem;
five others discussed on coffee spraying and pruning timings; 2 farmers discussed about maize planting techniques, while two others discussed about the viability of dairy and poultry farming establishment on their farms. One farmer had just discussed with the extension field officers about the establishment of the most viable project to undertake on the farm; 43 other farmers had not engaged in any discussions with the extension service officials. These findings generally show that the channels of extension service information are inadequate, and on the whole 'one way street.' Roling and Ascroft (1971) saw communication as emanating from a source, through a medium, then feedback and effect. Some findings in the Nzoia scheme reveal that in some instance, the extension field workers did not follow-up whatever discussions made with the farmers. One farmer reported putting off altogether a poultry project because he was not able to receive more information from the extension field officer.

The Kakamega District Development Plan, (1984-88:35) had recommended proper training and sufficient deployment in numbers of the extension service if agricultural production had to be increased drastically. The findings about the performance of the extension service in the scheme shows a lot of inadequacy, as reported by the farmers. Forty-eight farmers reported that such performance was very unsatisfactory. There were 45 other farmers who generally considered them doing their work unsatisfactorily. There were only 3 farmers who were indifferent about the way the extension service does its work; and 3 others who reported that they performed in a
satisfactory manner. However, further observation revealed that the extension field officers were generally inadequate in numbers, inefficient in their work and not easily accessible when farmers have urgent problems (22 farmers). There were 18 farmers who saw them as inefficient and not easily available. Eleven farmers saw them as inadequate in their numbers and inefficient; while seven others reported them as inefficient, inaccessible and biased in their services against poor farmers. Six farmers saw them as inefficient; five farmers reported inadequate numbers, inefficient and biased service. The rest of the farmers reported the various combinations of inadequate numbers, work inefficiency, inaccessibility and biased service to them. All in all, the farmers in the scheme appear to show a lot of dissatisfaction about one of the most vital components of rural development.

Implicit in such sentiments is that some farmers appear to view their present low performance in the scheme in terms of inadequate advice from the extension service. This in a way tends towards our proposition that the intensity of extension service and the nature of advice is crucial, more so to the average farmers, in their innovative capacities.

This study showed that most artificial insemination (A.I.) service centres along the roads were actually situated quite far-off. There were only 22 farmers who reported residing within half a kilometre of such centres. (see table 11 below). A total of 52 farmers
stayed between one and two kilometres of such centres. Twenty others were three kilometres away and over. The longest distance reported was 3.5 kilometres and the shortest 0.04 kilometres. However, the mean was as high as 1.592 kilometres. This shows that 72 farmers interviewed had to travel one kilometre and over to get A.I. service. It is probable, therefore, that most of the farmers interviewed were disillusioned about the whole operation of the A.I. service. In this case a total of 55 farmers considered the present A.I. service in the scheme as just very inadequate. Thirty-three others viewed it as generally inadequate, while 4 others saw that it was fairly adequate, and three farmers reported that it was adequate.

Table 11: Distance covered by farmers to A.I. centres:

<table>
<thead>
<tr>
<th>Distance in kilometres</th>
<th>No. of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto 0.5 Km</td>
<td>22</td>
</tr>
<tr>
<td>Upto 2.0 Km</td>
<td>52</td>
</tr>
<tr>
<td>More than 3.0 Km</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>94</strong></td>
</tr>
</tbody>
</table>

Generally there was no farmer who reported getting A.I. service on the farm individually. The table 12 below shows the ratings of the A.I. service adequacy in the scheme by farmers.
Table 12: The farmers rating of A.I. service in the scheme:

<table>
<thead>
<tr>
<th>Degree of A.I. service rating</th>
<th>No. of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Inadequate</td>
<td>55(%)</td>
</tr>
<tr>
<td>Inadequate</td>
<td>33(%)</td>
</tr>
<tr>
<td>Fairly adequate</td>
<td>4(%)</td>
</tr>
<tr>
<td>Adequate</td>
<td>3(%)</td>
</tr>
<tr>
<td>Missing/other</td>
<td>5(%)</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

A total of 57 farmers reported that they used neighbours bulls as an alternative to missed A.I. services. There were only 24 farmers interviewed who reported using or having 'bulls' on their farms. Four farmers reported that in most times their cows mate during dipping days; one reported that they mate at watering places at rivers. Two farmers reported both during dipping and watering times with therefore bulls from neighbours. There were twelve other farmers who never responded, because five never had cattle present while seven used A.I. services always. See table 13 below.

It will be realised that what was clear from the study is that most of these bulls used in place of missed or unavailability of A.I. service are not necessarily pure breeds. This is as a result of some farmers having introduced the zebu type of breed in the
Table 13: The farmers alternatives to A.I. service in the Nzoia Scheme:

<table>
<thead>
<tr>
<th>Alternative used</th>
<th>No. of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neighbour's bulls</td>
<td>57(%)</td>
</tr>
<tr>
<td>Bull on the farm</td>
<td>24(%)</td>
</tr>
<tr>
<td>During dipping sessions</td>
<td>4(%)</td>
</tr>
<tr>
<td>During dipping and watering sessions</td>
<td>2(%)</td>
</tr>
<tr>
<td>At watering places</td>
<td>1(%)</td>
</tr>
<tr>
<td>Others</td>
<td>12(%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100(%)</strong></td>
</tr>
</tbody>
</table>

scheme, with some of these bulls having been cross-bred from zebu cows. As Goldson (1977:64) noted, this might also be compounded by the problem of poor or non-disposability of low quality bulls due to the farmers ignorance. With time, the whole process of uncontrolled breeding and underbreeding leads to gradual breed degeneration, coupled with low levels of animal husbandry and inadequate technical know-how in grade dairy farming by some farmers.

In a way, the foregoing observation may shed light in explaining why we considered that most farmers grade cattle had actually degenerated in their breed conditions. There were only twenty farmers whose cattle could be considered well managed, and with satisfactory breed condition maintenance. The rest of the farmers...
who had some dairy cattle reported having such with varying conditions ranging from highly degenerated to just degenerated. There were seven farmers without dairy cattle.

The contingency coefficient analysis shows that there is not much significant association between extension discussions reported and A.I. service use or not by the farmers (0.36614). This is at 8 degrees of freedom. (see the contingency table 14 below).

Table 14: The association between the nature of the extension session discussions and the use or not of A.I. services in the scheme:

<table>
<thead>
<tr>
<th>Nature of discussions</th>
<th>No. of farmers not using A.I.</th>
<th>No. of farmers using A.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm terracing</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Most viable project</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Coffee plantation establishment</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td>Pruning; spraying coffee</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Maize planting techniques</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Dairyinging and poultry establishment</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Were directed on just what to do</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Has never arisen need yet</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Only came to treat cattle</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
However, there is greatly a significant association between dairy farming advice and animal condition, (0.70711), with 6 degrees of freedom. This may go in to explain the vitalness of extension service in the adoption capacity of farmers to innovation. On the other hand, this high association may be explained from the fact that those farmers who received the dairy farming advice were only six (see table 15 below).

Table 15: Association between the nature of dairy animals condition and the extension advice:

<table>
<thead>
<tr>
<th>Nature of advice</th>
<th>Total number of farmers reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nature of advice</td>
</tr>
<tr>
<td>Grazing methods</td>
<td>1</td>
</tr>
<tr>
<td>Dairy management</td>
<td>0</td>
</tr>
<tr>
<td>Calf Feeding</td>
<td>1</td>
</tr>
<tr>
<td>Animal spraying</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
</tr>
</tbody>
</table>

The findings of this study about dairy farming management capacities showed that most farmers were not doing good farming.
There were only two farmers who were found to manage their dairy farming to a very great extent. However 29 farmers managed their stock to a great extent. Hence, only about a third of the farmers studied could be termed as doing better. There were 26 farmers who were rated to manage their cattle to a small extent; while sixteen were rated as managing to a very small extent.

In this case, it was observed that three quarters of farmers were not excellent dairy farming managers on their farms. As were seen, they may therefore be termed as not innovative enough, an explanation that may be implicit in the found low levels of extension service in the scheme. The low milk levels reported in the scheme, as compared to the initial levels, may also be explained by the same circumstances (see tables 16 and 17 below). Table 17 shows that there were only 34 farmers who reported producing somewhat more milk presently. There were three farmers who never had registered any changes in their milk levels; while 63 farmers reported producing lower milk levels presently.

Table 16: Levels of dairy farming management ratings of farmers:

<table>
<thead>
<tr>
<th>Management levels/capacity</th>
<th>Number of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>To a very great extent</td>
<td>2</td>
</tr>
<tr>
<td>To a great extent</td>
<td>29</td>
</tr>
<tr>
<td>To some extent</td>
<td>26</td>
</tr>
<tr>
<td>To a small extent</td>
<td>23</td>
</tr>
<tr>
<td>To a very small extent</td>
<td>16</td>
</tr>
<tr>
<td>Missing</td>
<td>4</td>
</tr>
</tbody>
</table>
Table 17: A comparison of milk levels for individual farmers since joining the scheme:

<table>
<thead>
<tr>
<th>Present milk levels</th>
<th>Number of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Now much higher</td>
<td>28</td>
</tr>
<tr>
<td>Now slightly higher</td>
<td>6</td>
</tr>
<tr>
<td>No change</td>
<td>3</td>
</tr>
<tr>
<td>Now slightly lower</td>
<td>8</td>
</tr>
<tr>
<td>Now much lower</td>
<td>47</td>
</tr>
<tr>
<td>No milk now</td>
<td>8</td>
</tr>
</tbody>
</table>

Total 100

Most farmers who produced less milk levels presently explained that they considered their present dairy farming management as having deteriorated, compared to the initial times when they joined the scheme (see table 18 below). Another ten farmers, apart from the management problems, reported problems with the extension services. In this latter case, the problems were seen in terms of inadequate veterinary and A.I. services, inadequate cattle drugs and unreliable A.I. services. The management problems related to lack of adequate technical know-how, inadequate capacities to supplement cattle feeds, having fewer animals presently, degenerated animal breeds, improper breeding methods and frequent cattle drying-up and long periods before cattle calved down.
Seven farmers reported poor management and inadequate development capital at their disposal. The latter related to having inadequate liquid capital, expensive cattle drugs and paying substantial amounts of fees. There were six farmers who reported management and ancilliary services problems. The latter was in terms of unavailability or inadequate piped water on the farm, inadequate dipping facilities or poorly maintained and hence ineffective. Four farmers reported problems of extension services, management and ancilliary services, while one farmer had just ancilliary service problems.
However, a look at general problems reported by all farmers shows that these same problems are not only peculiar to farmers who were found to produce lower milk quantities. It may then be that what affects the general and individual farmers' milk production capacities is the magnitude and size of the various problems. Nevertheless, the differences will be compounded by personal characteristics such as individual energies invested in the enterprise, entrepreneurship and a good foresight for the future planning on the farm. Table 19 below shows the various problems encountered by farmers since they joined the scheme.

It can be seen that management problems preponderate. Eighteen (18) farmers combine these with those of extension services and ancillary services. In addition to what we already saw about the breakdown of extension services problems, here will also include inadequate cattle drugs or their unavailability, poor veterinary attendance and uncontrolled cattle mating due to too many 'freelance' bulls owned by some farmers. Ancillary also includes poor feeder roads; far-off milk collection centres, poor water supply system and its management, cattle diseases due to many prevalent ticks (probably due to poor or inadequate dipping facilities). Management problems also incorporate cattle deaths, cattle degeneration, inadequate pastures, ticks in marshes, land dispute, and diseases on the farm. Capital problems will also include expensive cattle drugs and feeds.
Table 19: Major problems encountered by the farmers since joining the scheme:

<table>
<thead>
<tr>
<th>Kind of problems</th>
<th>No. of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management; Extension service and Ancilliaries</td>
<td>18</td>
</tr>
<tr>
<td>Management and Ancilliaries</td>
<td>17</td>
</tr>
<tr>
<td>Ancilliaries</td>
<td>13</td>
</tr>
<tr>
<td>Management and capital</td>
<td>10</td>
</tr>
<tr>
<td>Management; capital and ancillary</td>
<td>7</td>
</tr>
<tr>
<td>Management, capital, extension and ancilliaries</td>
<td>7</td>
</tr>
<tr>
<td>Capital; Extension; Ancilliary</td>
<td>7</td>
</tr>
<tr>
<td>Capital and Ancilliary</td>
<td>8</td>
</tr>
<tr>
<td>Management</td>
<td>5</td>
</tr>
<tr>
<td>Management, Capital Extension</td>
<td>3</td>
</tr>
<tr>
<td>Ancilliaries</td>
<td>2</td>
</tr>
<tr>
<td>Development capital</td>
<td>1</td>
</tr>
<tr>
<td>Management and extension</td>
<td>1</td>
</tr>
<tr>
<td>Capital and extension</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

The contingency coefficient for the cross-tabulation of management capacity with the kind of animals farmers were presently keeping is highly associated, at 0.68742. This is at 52 degrees of freedom. These findings tally with those of Rutenberg (1966:73) who found considerable decline in animal husbandry, despite government support, as most settlers were not acquainted fully with the requirements of commercial dairy farming. He saw that
there had been inadequate feeding of dairy animals during the
dry seasons, and that generally, calving intervals averaged twenty
months, and calf feeding became quite a problem. The conclusion
here is that these problems still persist for the Nzoia scheme. In
another study, Pollard (1981:581) had similarly seen that, with time
there had been gradual depletion of stock numbers and increased
degeneration of pasture conditions, in the line of animal husbandry
problems.

The findings in the scheme also showed that there was very little
record keeping by farmers. There were only eleven farmers who
reported ever having made farm records at one time or another in the
last five years. See table 20 below. Note that the type of records
kept overlap for each of the eleven farmers reported. All these
farmers did not make any records on the visits by the extension
service, and on any discussions and recommendations if there were
any engaged into. Generally, these records tend towards the inputs
costs and outputs made in the named agricultural enterprises. All
the farmers who kept these records believed that such were beneficial
in their farming. In this case, seven farmers reported that they
wanted to know the benefits and/or losses in their agricultural
farming. The other four reported that they wanted to account for
the various inputs and outputs in their farm enterprises. This
similar low rates of record keeping by farmers had also been
observed in a similar study by Pollard (1981:565).
Table 20: The types of records kept by farmers in the scheme:

<table>
<thead>
<tr>
<th>Type of records kept</th>
<th>No. of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy farming cattle feeds and treatment costs</td>
<td>6</td>
</tr>
<tr>
<td>Cattle feeds only</td>
<td>3</td>
</tr>
<tr>
<td>Milk production trends per cow</td>
<td>8</td>
</tr>
<tr>
<td>Milk production trends and calving frequencies per cow</td>
<td>1</td>
</tr>
<tr>
<td>Inputs and outputs in arable</td>
<td>9</td>
</tr>
<tr>
<td>Coffee spraying expenses; and costs of inputs and outputs in maize</td>
<td>1</td>
</tr>
<tr>
<td>Inputs in maize and horticulture</td>
<td>1</td>
</tr>
<tr>
<td>Balancing in inputs and outputs</td>
<td>10</td>
</tr>
<tr>
<td>Salaries for workers</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

There were a total of 36 farmers in the sample who reported not to have paddocked their grazing fields, allowing their animals to 'roam' everywhere in the pasture fields on the farm.

Even the sixty-four farmers who reported having paddocked their grazing lands were in some instances found not to be strictly observing rotational grazing procedures. For instance, some paddocks had broken fences between them, and there generally never appeared a concrete rotational grazing procedure followed therefore.
This was partly observed from the conditions of pasture fields which had almost no signs of fallowness. This problem was even further compounded by the very realisation that most of the pastures were naturally growing and with almost no management of such. The possibilities of the misuse of pastures under such conditions were bound to occur, making them become of poor quality. This may explain why we found that fifty-two farmers reported that they believed their pasture resources were generally inadequate for their cattle.

In an attempt to offset this pasture inadequacy, some farmers reported that they had planted napper grass with which they supplemented the shortage. These twenty-four farmers also bought other supplements such as maclik, bran etc. But eleven farmers reported grazing favours from neighbours who appeared to have plenty of pastures. There were five farmers who reported grazing along the sides of the road only; while five others reported sometimes grazing along the sides of the road or had small resources of planted napper grass. Two other farmers reported that they grazed their cattle along the sides of the road, at the market place or sometimes on the neighbours farms. There were three farmers who reported that they grazed their cattle along the road, on their neighbours farms or had planted some napper grass and sometimes bought some feed supplements. Two farmers just reported asking favours from their neighbours.

This realisation about the inadequacy of pastures for dairy cattle simply means some farmers are unable to cope with the
requirements of the dairy farming innovation in the scheme. Further more, such kind of grazing procedures, especially along the road sides and on neighbours farms or market places, may prove quite a problem in attempts to control cattle diseases in the scheme.

4.1.3: The quantity of milk produced versus consideration of dairy farming as major activity at farm level:

The realisation in the Nzoia scheme was that farmers mainly engaged in two farm activities, dairy farming and maize production. The other activities the farmers reported engaging in, but not on full-time basis, were planting sunflower, beans, irish potatoes, and simsim. However, as was noted elsewhere, there was problem of computing their income in the last five years, since most farmers never considered them as major crops, and in which they engaged only occasionally. In this case, the only major activities were the two initial ones above, and which thus formed our basis of comparison for the farmers in choosing which as the major activity on the farm.

It had initially been observed how income levels were quite disparate in the scheme. In addition, such in the scheme would also be accounted for by what a farmer considers as the major activity on the farm, and the number of acrapages (farm size?) he has set aside for the same. The majority of the farmers (54%) in the scheme
reported engaging in milk production as their major activity on
the farm. Another 45% reported having arable farming (maize
production) as their most important activity on the farm. The
others, one had no idea of what was considered the most vital
activity he engaged in, while the other remaining was a case of
an 'abandoned' farm on which no production activity ever took place.

It is our belief that this differentiation in electing
what to specialise in as a major activity or enterprise can never
be termed coincidental, on the part of the farmers. It is
interesting to note the nature of accompanying criteria employed by
the farmers in the scheme. At a glance, the conclusion we can
make is that these reasons used centre mainly around the personal
attributes of the individual farmers in the scheme. The 50
farmers among those who considered dairy farming as their major
activity (53 in total) reasoned that the activity provided a steady
monthly income likely to offset most of the current expenditures
and other financial emergencies both on and off the farm. The other
three farmers majoring in dairy farming considered the activity more
labour saving, compared to the general arable farming enterprise.
However, also implicit in this reason is that they also derive a
more steady monthly income from milk production.

There were eleven farmers who engaged in arable farming
because they considered it relatively less risky in comparison to the
precarious dairy grade animals "where you are never sure when cattle
diseases strike, and might easily wipe out the whole herd."

Such farmers would thus most likely be risk averse. There were other eleven farmers who engaged in maize production as a major activity because they fetched quite a lumpsum yearly income from the same. Such had also considered that despite milk production providing a monthly income, sometimes this income was too low to adequately augment all the financial requirements on the farm. A particular example cited was that usually at the beginning of every year, for some, the financial constraint was so heavy that they could only manage with a lumpsum income. To them, this was provided for from the sales of maize from the previous year's harvest. The reckoning is that there is usually higher fees amounts to be paid when schools open for first terms compared to other terms in the academic years. School fees payments made by the farmers averaged Ksh. 11,000 per year over the last five years each year. The minimum however was Ksh. 700 as compared to a maximum of Ksh. 32,000 for one farmer who reported having a child schooling in India.

On the other hand, there were ten farmers who engaged in maize production as a major enterprise on the farm because it was the only income earning source on the farm. Such also might have kept some milk animals providing subsistence milk to the household. Nine farmers considered arable farming as less complicated and hence the input in terms of their management also relatively less demanding. This was in addition to one farmer who actually considered arable farming as needing very little actual technical knowhow. One
farmer never engaged in commercial dairy farming because the family operated the same on a different farm elsewhere; while two farmers had maize farming as the only activity on the farm then. There were two missing responses, thus one farmer was unable to make out what he majored in between dairying and arable farming, while the other had no productive activity on the farm presently having been engaged in the formal sector for employment.

The production of milk in the Nzoia scheme was found generally to be extensive in nature. In this case, the farmers kept extensive pasture fields on which the milk animals grazed, in some cases on 'free-lance basis' as the farmers had not divided such lands into paddocks (36 farmers). However, the majority (64) reported having paddocked their grazing lands. Some farmers reported having planted nappier grass, but even this was mainly fed to the cattle during milking times. It is therefore, possible that the acrage amount spared for the major activity on the farm corresponded, particularly to dairy farming as the major activity.

The mean acrage reported by the farmers under their major activities was fifteen acres. But the minimum was three, as contrasted to a maximum of 75 acres, in the case of a farmer who owned more than one plot in the scheme.

These findings, inter alia, are concurrent with those of George and Chokshi, (1977:2) in their consideration of dairy farming (and
in our case, decisions in what to engage in as a major activity) as a viable activity. For their case, farmers had to grapple with certain crucial decisions at the individual farm level. They had to decide on how much to invest in dairy farming (e.g., in terms of pasture land); what kind of milk production practice to be adopted (such as extensive or zero-grazing); and how to utilize the milk so produced at home. Accordingly, such decisions by a farmer should determine the quantity of milk produced; land utilization (patterns), purchase of inputs, family consumption of milk, dependence on middlemen and interaction with local community in terms of organizing collective activities.

On the other hand, Carlstein (1974:1) observed that in the reorganization of large scale social systems, as regions (the Nzoia schemes?) or nations, involves huge human projects of tremendous range and complexity. That, however, such could (easily) be limited by the capacity of performance within its institutions, and limited capacity to transform them. Such limitations, and (likely) potentials, could perhaps be better understood in the context of how the population in a region (individual farmers) is able to use its time and space (land resources) resources for different types of individual and collective projects. In this case, the author appears to hold that individual farmers capacities and perceptions are crucial at the individual farm level performance. This is supported by Mbilinyi (1976:68) that in peasant farming, differences in production emanate from their perceptions about such areas of decision making as what to produce; method of production; quantity
to produce of each enterprise (milk and maize); when to produce and when to buy and sell.

The data on dairy farming production levels in the scheme shows that most farmers general production is low. Sentiments expressed by some farmers appear to tilt towards the thoughts that there is generally inadequate advice from the extension service. Production levels in milk were considered in the dry and wet seasons. During the former, a majority of sixty-seven farmers reported producing only upto ten kilogrammes of milk for sale. There were fourteen others who produced upto fifteen kilogrammes, while only twelve respondents produced beyond sixteen kilogrammes and above of milk for sale. See table 21 below:

Table 21: Amount of milk in kilogrammes supplied for sale in the Nzoia scheme during the dry seasons

<table>
<thead>
<tr>
<th>Number of kilogrammes supplied for sale</th>
<th>No. of farmers</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto ten (10) kg</td>
<td>67</td>
<td>72</td>
</tr>
<tr>
<td>Upto fifteen (15) kg</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>More than 16 kg</td>
<td>12</td>
<td>12.9</td>
</tr>
<tr>
<td>Total</td>
<td>93</td>
<td>99.9</td>
</tr>
</tbody>
</table>

There were seven farmers who did not presently have any dairy cow on the farm and were therefore not supplying any milk for sale.
Table 22 below shows the levels of milk supplied for sale during the wet seasons in the scheme. There were forty-six farmers who produced up to 10 kilogrammes; twenty others produced up to 15 kilogrammes; while the remaining twenty-seven produced beyond sixteen kilogrammes. These findings show that most farmers produced and supplied more milk for sale in the wet seasons than in the dry seasons. This occurrence may be explained simply from the fact that there is relatively more plenty pastures (natural) available to the animals, and in turn which produce a lot of milk. At face value, it indicates somehow most farmers depend on 'nature' in much of their dairy farming. This may go along way in justifying that there is little manipulation undertaken, generally, for increased milk production for most farmers in the dry seasons.

Table 22: Amounts of milk supplied for sale during the wet seasons in the scheme by farmers:

<table>
<thead>
<tr>
<th>Number of kilos supplied for sale</th>
<th>Number of farmers</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto 10 kilos</td>
<td>46</td>
<td>49.4</td>
</tr>
<tr>
<td>Upto 15 kgs</td>
<td>20</td>
<td>21.5</td>
</tr>
<tr>
<td>More than 16 Kgs</td>
<td>27</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td>93</td>
<td>99.9</td>
</tr>
</tbody>
</table>
Further evidence shows that nineteen farmers reported that their animals usually dry-up because of the dry seasons, implicitly times when there is pasture shortages. There were eleven others who reported that low levels of milk production resulted from the frequent cattle deaths, and which was also coupled with most of those surviving drying-up. Nine farmers reported cattle deaths as the only major problem here; while six others reported that low milk levels sometimes resulted from their animals being in-calf almost simultaneously, and consequently having dried up altogether.

Three farmers reported cattle deaths and sometimes being compelled to sell milk animals to off-set urgent financial requirements, such as school fees. Three others were even more explicit in their reasons that such were usually times when they had inadequate water and pasture shortages. Two farmers had problems of cattle deaths because they believed they exercised inadequate management and animal husbandry. One farmer reported frequent cattle diseases, such as foot and mouth rot which 'disabled' his milk cows frequently, and problems of cattle drying-up; while another saw that there were problems of cattle deaths and inadequate pastures. See table 23 below, which shows more explicitly the reasons provided by the farmers for producing very low levels of milk sometimes. The table shows there were other three farmers who reported problems of artificial insemination services. In this case, the unreliability of the A.I. service led to their cows missing the service repeatedly, and hence taking long periods before calving down.
Table 23: Reasons reported for the low-levels of milk produced in the scheme:

<table>
<thead>
<tr>
<th>Reported reasons</th>
<th>No. of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle drying up and dry-seasons</td>
<td>19</td>
</tr>
<tr>
<td>Cattle deaths and drying-up</td>
<td>11</td>
</tr>
<tr>
<td>Cattle deaths</td>
<td>9</td>
</tr>
<tr>
<td>Cattle drying-up and being in-calf</td>
<td>6</td>
</tr>
<tr>
<td>Cattle deaths and selling for fees</td>
<td>3</td>
</tr>
<tr>
<td>Inadequate water and pastures</td>
<td>3</td>
</tr>
<tr>
<td>A.I. service problems</td>
<td>3</td>
</tr>
<tr>
<td>Cattle deaths and inadequate husbandry</td>
<td>2</td>
</tr>
<tr>
<td>Cattle deaths and inadequate pastures</td>
<td>1</td>
</tr>
<tr>
<td>Frequent cattle diseases and dry seasons</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
</tr>
</tbody>
</table>

The table above shows that most farmers in the scheme, at least, have increased dairy farming animal husbandry and management problems. Of course this could be compounded by other problems such as inadequate capital resources to some farmers. This will definitely make such farmers less able at sustaining successfully the dairy farming innovation in the scheme. Additionally, most of these farmers may elect dairy farming as their major enterprise on the farm, but whose monthly income is relatively too low to make any greater impact in farming generally.
The F.A.O. of United Nations, (1973:43) observed, in relation to Sudanese Livestock development, that problems in low overall livestock output was in relation to under-utilization and improper utilization of the pasture resources, low herd productivity, inadequate infrastructure and other service. These observations appear to feature greatly in the Nzoia scheme's case. Nyholm (1975:34) found that the economic behaviour of some farmers was largely responsible for low-milk yields, such as non-breeding, non-replacement of old stock, and non-purchasing of dairy farming inputs (such as supplementary feeds). These sentiments were also observed by Russel (1962:172), Wells (1968:8 - 64), F.A.O. of U. N. (1967:10-19), Stotz (1979: 7-8) and Pollard (1981:581).

A cross-section of the farmers studied reveals that a total of forty-three farmers either actually owned some zebu cows or had cross-breeds from local zebu cows. This was sometimes in addition to having some grade dairy animals, but of poor health conditions. There were other fifty farmers who reported they owned grade dairy cows, which were of various health and breed conditions. This was in addition to other smaller livestock, such as sheep, goats and donkeys. There were two farmers who then owned only sheep on their farms. This is in contrast to the situation when the farmers were given an average of five grade dairy cows on joining the scheme. But these had been of various genetic breeds, such as the friesians, guernseys, Jerseys, Aryshires and Redpolls etc. The findings thus indicate that there have been differential capacities at the integration of the grade dairy
farming innovation amongst the farmers in the Nzoia scheme generally. The resultant consequence has been that some farmers have tended to fall back to the less 'fragile' zebu cattle with less management requirements.

These findings in the Nzoia scheme are in accord with Kenya's 1974-78 Development Plan (p. 17) which saw that by 1974, 90% of all adult female stock in the nation were zebu cattle, which have low yields. In the light of the 1980-82 rough estimates of livestock in the Kakamega District, our findings in this case show that the pattern has not drastically changed since mid 70's. See table 24 below. This compares the absolute changes in numbers of livestock of zebu and grade cattle in the district during the years 1980-82. The statistic are adopted for the case of the Lugari Division only, in which our area of study falls.

Table 24: The zebu and grade cattle population for Lugari Division, Kakamega (Source: Kakamega District Development Plan 1984-88 pp. 29).

<table>
<thead>
<tr>
<th>Type of cattle breed</th>
<th>Period</th>
<th>%change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1980</td>
<td>1982</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zebu cattle</td>
<td>5,343</td>
<td>91,573</td>
</tr>
<tr>
<td>Grade cattle</td>
<td>18,525</td>
<td>22,515</td>
</tr>
</tbody>
</table>
These findings then show that there have been fundamental changes in the populations of Zebu cattle, compared to grade cattle. This change in zebu cattle can basically be attributed to their importations from the rural areas of the district and other surrounding regions. The explanation regarding this trend was seen in the light that high increases in number of grade cattle could not be achieved due to the high rate of deaths from tick-borne diseases, estimated to claim up to 30% of the progenies of A.I. and approved bulls (The Kakamega District Development Plan, 1984-88:29).

Implicitly, therefore, most farmers prefer the zebu cattle breed, and with various interesting reasons for keeping such. Of the forty-one farmers with zebu or zebu-crossed breeds, 14 reported such being hardy and less risky. Six farmers kept such by virtue of them having resulted from uncontrolled mating with other farmers' zebu/cross-breed bulls; four farmers considered them more easily manageable. Six other farmers had such paid to them as dowry; four others kept zebu oxen for ploughing. There were three farmers who kept zebu cattle which provided them the only milk for subsistence and oxen for ploughing; while one farmer reported keeping zebu, vis-a-vis grade dairy cattle, whose calves he sold for school fees and oxen for ploughing his land. Another farmer reported that such had been given to their children by the grandparents and hence could not be dispossessed off lest they aroused the anger of the latter; and yet another farmer had actually allowed a workman to rear zebu cattle alongside his own grade cattle.
Two others, one kept zebu cattle because they were more resistant to diseases and used or consumed relatively less pasture quantities (and hence lesser investments), while the other used them for ploughing and had also received them for dowry.

The contingency coefficient analysis, in our case however, reveals that there is not a significant association between sex and the respondents disposition at keeping the zebu cattle or zebu cross-breeds, (0.31423 at 10 degrees of freedom). However, there is quite a significant association between ethnicity and the type of animals the farmers were presently keeping on their farms. Thus a contingency coefficient of 0.67409, with 84 degrees of freedom. In this case there is a suggested association that all the ethnic groups in the scheme have a preference for keeping grade dairy cattle and sheep on their farms (see table 25 below). There is also a marked association (0.56144) between ethnicity and the reasons for keeping zebu or zebu cross-breeds. In this case, all these groups consider such animals generally less risky to keep and are hardy. This is at 40 degrees of freedom. This is also reflected in the association between the farmers levels of management and animal husbandry, with the reasons for preference of zebu cattle or cross-breeds. Thus, the contingency coefficient of 0.66582, with 30 degrees of freedom.
Table 25: The association between ethnicity and type of animals farmers kept on their farms:

<table>
<thead>
<tr>
<th>ETHNIC GROUP</th>
<th>NO ANIMALS</th>
<th>NO ZEBU C. BREED</th>
<th>GRADE ZEBU AND CROSS-BREED</th>
<th>GRADE ZEBU AND SHEEP</th>
<th>GRADE DONKEY</th>
<th>GRADE GOATS</th>
<th>GRADE SHEEP</th>
<th>GRADE SHEEP DONKEY</th>
<th>GRADE CROSS BRED</th>
<th>GRADE SHEEP CROSS BRED</th>
<th>GRADE ZEBU SHEEP CROSS BRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>KALENJIN</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>KAMPA</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>KISII</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LUHYIA</td>
<td>4</td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>21</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>KIKUYU</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>LOU</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TESO</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>10</td>
<td>29</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>8</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
The contingency coefficient for farm decision making with the reasons for preference of zebu or cross-breeds shows quite a significant association at 0.65578, with 30 degrees of freedom. We found from the study that most decisions are made jointly by husband and wife (59 farmers). Twenty-seven other farmers reported that farm decisions were at the discretion of the husband; while seven others (widows) reported decisions made by wives. Five farmers reported decisions by husband and elder son jointly; while two reported decisions by elder sons.

On the other hand, we found that the extension field workers do not necessarily discuss with the decision makers themselves. In fact most farmers reported that such field officers talked to anybody responsible they found on the farm at the time of their visits (40 farmers). What then appears is that the 'anybody' has to make a report to the decision maker later. This meant giving second hand information which is bound to have a lot of technical loopholes. There were nineteen others who reported that field extension officers talked only to husband or wife whenever they came; while sixteen reported talks to wife only. Four farmers reported talks to husband only; two to elder wife only, while two others reported extension officers talking to farm manager, and the other farm worker. There were seventeen farmers who reported that it had been a long time since the extension field officers ever visited their farms, and hence no
One conclusion from these findings is that in cases where the extension personnel talked to anybody, there is bound to be communication breakdown and discontinuity by the decision maker in taking up or applying extension service advice recommendations. The conclusion implies that there may be erroneous reports to the decision maker particularly where it relates to matters of technicalities, such as the use and prescriptions of drugs and chemicals as advised. On the whole there are possibilities if discarding some of the recommendations by the decision maker,
such as in cases where a household member initially discussed with the extension officer, but later can not express the same more coherently. Such a situation may have an effect on the innovativeness degree, and the possible consideration of a major activity on the farm, more so where such involves a lot of technicalities. This may explain some of the reasons why some farmers have fallen out with grade dairy farming, let alone as a major activity on their farms.

However in relation to investment possibilities in dairy farming as a major activity, there is not a significant association with sex, 0.32180 with 7 degrees of freedom. But there is a marked association between ethnicity and investment in dairy farming development (0.53351). In this case all the ethnic groups have a preference also for making investments in pasture development and cattle replacement. In this latter case, 22.1% of the Luhyas; 42.9 of the Kikuyus and the only single Kamba had made investments in this line.

There is also a marked association between the levels of management capacity and the desire to invest more in milk production (0.49331), with 20 degrees of freedom. In any case, higher levels of management and animal husbandry should more directly be related to the levels of innovativeness among the individual farmers. See the contingency table below (table 27). There is also a similar kind of association between those who make decisions on the farm and the
very desire for increased investment in milk production, 0.48532 at 20 degrees of freedom.

Eight farmers reported never to have replaced their old stock, such as through purchasing others of better quality breeds for increased milk production. It is however interesting to note some of the methods reported by some farmers that were used to replace some of their old stock. Forty-two farmers reported such replacements occurring through natural herd replacements and purchasing others in some instances. Thirty-five farmers reported that their cattle replaced themselves naturally through procreation; while four farmers usually purchased other stock. Four others reported natural replacement and upgrading of zebu through cross-breeding with grade cattle; while three others reported natural replacement and receiving others through dowry payments to them. Two farmers reported natural replacement, dowry payments and transferring zebu cattle from their original home areas; while one farmer replaced his old stock by cross-breeding zebu with grade cattle; yet another reported having replaced his cattle through dowry payments only.

These findings show that slightly more than half of the farmers in the scheme studied appeared not to be seriously in control of the quality of their dairy cattle. This is in addition to the reported problems of increasing low-quality bull population and uncontrolled mating, therefore, when cattle meet during dipping days. This might be an implicit impediment to average and below level dairy farmers in the scheme taking to this activity as a major one on the farm.
Table 27: The association between the levels of management capacities in dairy farming and the desire to invest more in the same:

<table>
<thead>
<tr>
<th>Level of Management Capacity</th>
<th>To Generate More Income</th>
<th>Generate Steady Monthly Income</th>
<th>Increase Overall Returns From Milk</th>
<th>Increase the Monthly Income Obtained</th>
<th>More Income and Higher Monthly Returns</th>
<th>Steady Income and Higher Returns</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Av. Great Extent</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>(2.8%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To a Great Extent</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>9</td>
<td>29</td>
</tr>
<tr>
<td>(40.8%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To Some Extent</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>(28.2%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To a Small Extent</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>(23.9%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To a Very Small Extent</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>(4.2%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>12</td>
<td>7</td>
<td>11</td>
<td>9</td>
<td>21</td>
<td>71</td>
</tr>
<tr>
<td>(15.5%)</td>
<td>(16.9%)</td>
<td>(9.9%)</td>
<td>(15.5%)</td>
<td>(12.7%)</td>
<td>(29.6%)</td>
<td></td>
<td>(100%)</td>
</tr>
</tbody>
</table>
4.1.4 The likely effects of family size on the quality of dairy farming development at the individual farm level.

The data on households populations reveal a relatively large family size among the respondents in the scheme. The average number of children was found to be eleven, casting a typical reflection of the nature of family sizes in rural Africa, and most other developing countries. This has been observed by Hunter (1969:8), Higgins (1959:46), Kocher (1968:22) and Clough (1968:36) in relation to rural development problems. It is interesting to note that despite most households having monogamous marriages (66 households), as compared to 34 which had polygamous, the large family is prevalent. Caldwell (1968:74) made an observation that there was a relationship between the number of children borne to a woman and her educational level. In this case, women with lower standards of education were found in most cases to bear more children during their reproductive years. This situation appears to tally with our findings in the scheme, as we had seen earlier, about the general low levels of education among household women.

Further analysis on the situation in the scheme reveals that despite the ages of the household, as was already seen, seventy one households out of the one hundred studied had at least a child yet to go to primary school, with the highest number being six children. There were only ten farmers whose children had all gone through primary school. But of the other ninety remaining households, they reported having between 1-11 children in primary school, while 24
households reported having five and above children there.

There were eighty-six households who reported that they had between 1-5 children in secondary school. Fourteen households reported having no children in secondary school. On the other hand, it is interesting to note that the study revealed that eighty-five households reported having no children in any kind of technical training. There were also eighty-seven households which reported having no children in any kind of colleges of post-school education.

However, there were fifty-eight households which reported having at least a child in one kind of employment or another. There were forty-two households which reported having no child in any kind of employment opportunities. This is a state of affair which is not encouraging in terms of the future development of the scheme, when the respondents (parents) come of active age in the not long future. In fact such circumstance tend towards our proposition that larger family sizes become a problem to dairy farming in particular, and farming in general in the scheme. On the other hand, the situation maybe that most of the respondents' children are actually school leavers awaiting some form of job opportunities or another. This is supported from the fact that seventy-three respondents reported that they had no child completely unemployable.

The problem of unemployable children (those whose educational qualifications can not warrant them a viable job) to parents is
double-edged. This is because in the first place, it is assumed parents use substantial financial resources for their education while at school. The hope from their parents is that they will be self-sufficient on completion of education, and even be more placed to help other family members and the ageing parents. Secondly, failure to attain competitive qualifications from school leaves the parents with an infinite responsibility for their children's subsistence.

There could be other consequences such as the ultimate compulsion on the part of the parents to subdivide the farm to such children. Under different circumstances, such children could have been able to purchase their own pieces of land elsewhere. The result is, as was realised with some households, there is a tendency for the over-all reduction in the productive capacity of the farm. This is worsened where also the general overall levels of education among the members of the household involved is also low relatively, and therefore low capital endowments. In this case, unless the head of the household engages in other off-farm income generating activities or farm production is above average, investment in children's education and who do not "re-emburse or replenish the kitty" leaves the parent in a more financially desperate position, with time.

There is no significant association between the respondents' marital status and types of dairy farming investments in the scheme, (0.30685). In this case, as reported, there were 93 respondents who
were married, while seven females were widows (see table 28 below). There was no response from one farmer.

Table 28: The relationship between marital status and types of dairy farming investments made by farmers.

<table>
<thead>
<tr>
<th>Preferred dairy investments</th>
<th>Married</th>
<th>Widowed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No investments</td>
<td>35</td>
<td>7</td>
<td>42</td>
</tr>
<tr>
<td>Cattle and Pasture</td>
<td>25</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Pasture &amp; Dip Spraying</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Dairy cattle replacement</td>
<td>14</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Pasture development</td>
<td>9</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Dip spraying</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Cattle; Pasture &amp; Dip Spraying</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>7</td>
<td>99</td>
</tr>
</tbody>
</table>

4.1.5: Milk marketing and other ancillary services in the scheme:

Most farmers in the scheme considered that the price offered by the Kenya Creameries Co-operative (K.C.C.) for their milk was relatively inadequate to cover their production expenses sufficiently (53 farmers). There were some farmers who made their own private arrangements for delivery of milk to K.C.C. (Kitale branch) and
were paid Kshs. 3.10 per kilogramme of milk approximately. These farmers had broken from the local Co-operative Society which used to market the farmers' milk supplies jointly. Those who still delivered their milk through the local Co-operative Society reported a net payment of Kshs. 2.10 per kilogramme of milk.

Twenty-nine farmers thought the price was sufficient or adequate to cover production costs; while eighteen others never seemed to know whether it was adequate or not, let alone the actual price paid per kilogramme of milk they supplied.

There were thirty-seven farmers who reported that they delivered their milk for sale through the local Co-operative Society. 17 of them said they delivered through the co-operative because they were members; 6 others believed that was the only outlet they knew of; 4 farmers saw the need to keep the co-operative running by being full-time members; 4 others believed their milk levels were too low to warrant direct delivery to K.C.C. (Kenya Co-operative Creameries); three farmers reported that they could not presently afford the expenses involved in delivery through K.C.C.; two farmers reported being members to the Co-operative and which they considered as the only marketing channel for their milk; while one farmer sold his milk through the co-operative simply because other farmers also delivered milk through there.

These findings show that over half of the interviewed farmers never send their milk through the local co-operative society any more.
These farmers (51) reported to have made their own private delivery arrangements with K.C.C., and hence had very little dealings with the Co-operative society in terms of marketing their milk. The local Co-operative Society had been the only milk marketing channel for all the members in the scheme, until late 1970's when some members began streaming out to institute their own private milk marketing with K.C.C.

The farmers who sent their milk directly to K.C.C. had various reasons for doing so. 14 farmers reported that they opted to send their milk directly to K.C.C. because they considered the local co-operative management as bent on exploiting milk producers, by, among others, undercutting on the milk price they offered. Thirteen farmers reported that K.C.C. paid more bonuses for their milk, more so during the dry seasons, which the local co-operative never did. In this case, as one farmer reported, "K.C.C. pays the local co-operative the overall milk bonuses, but which are not passed on to farmers in relation to the amount of milk delivered. Instead, the local co-operative management turns such money into co-operative expenditure, or even sometimes it ends into individual pocket."

Eight farmers reported that K.C.C. paid more money per quantity of milk (Kshs. 3.10 as compared to Kshs. 2.10 by local Co-operative per kilogramme of milk delivered). Four farmers wanted to reduce probable losses to returns on their milk sales. In this case, the farmers reported that initially when they sold their milk communally through the co-operative, there was frequent 'returning' of milk
because such was contaminated as several farmers mixed their milk in one single milk container. Hence when such milk was rejected by K.C.C., the farmers as a whole stood to loose, even when their milk was always clean, and hence unnecessary losses.

Four other farmers saw that K.C.C. paid reliably at every month end and one was always assured of an income provided the milk was delivered. In the words of one farmer, "sometimes the local co-operative could deposit less money in the bank, from sales delivered by farmers, and thus those farmers who went late to the bank had always to be 'bounced back' due to inadequate or no money in the bank." This tended to interfere with his plans, more so where there were emergencies.

Three farmers reported, that it was easier to make financial transactions with K.C.C.; especially where one was making repayments to some kind of loan. In this case, they saw that such money would always be paid provided the specific cash payment quantity was indicated. These farmers had taken a swipe at the local co-operative management "who purportedly deducted their milk money but never made payments to the institutions from which the farmers had borrowed money only to discover later that their loans were still outstanding, and never able to recover the money already deducted." For instance one farmer had reported "that he delivered one hundred and fifty bags of maize through the local co-operative meant to offset an Agricultural Finance Corporation (A.F.C.) loan borrowed a season earlier. However, a few months later, to his chagrin,
he found that the loan was never paid, and he had not yet recovered his money back, amidst A.F.C.'s threats to attach his property."

There were two farmers who opted from the co-operative delivery system to avoid unnecessary deductions by the management on their incomes. In this case, they had all reported "that sometimes the management arbitrarily deducted their milk money purporting to offset the repairs incurred in the repair of the co-operative lorry or other emergency expenses. That sometimes they could only be paid half their income for such months or nothing altogether, and that they could only get such money over a long time period as they were only paid in small amounts." One farmer, a female respondent, was not able to say categorically why she delivered her milk to K.C.C. directly, as had been the husband who made the arrangements on his own.

Generally therefore, most farmers in the scheme (about half) appear to have alot of disillusionment about the management of the local co-operative society and the way it is run. This clearly explains why many are opting out to make their own private marketing of milk, an occurrence which should never augur well for the co-operative movement and development in Kenya. As one clerk at the co-operative confided, "the present number of farmers who delivered milk through the co-operative were only about 37, and the co-operative has had to go its way to contract with other individuals in the areas outside the scheme whose milk it transports to K.C.C. He saw that otherwise the co-operative would not be able to meet transportation
expenses and the lorry would have broken down long ago."

Hyden (1970; ) had among others, observed that the co-operative societies were an important component of rural development programmes, but that such are also faced with problems such as ethnic rivalry and financial mismanagement, resulting to the crippling of many co-operative societies in Kenya, hence not quite possible for them to contribute meaningfully to the nation's agricultural programmes implementations. The Kakamega District Development Plan, (1984-88:20) made observations which tend towards our findings. It had been observed that despite the numbers of primary co-operative societies having gone up, and their membership, between 1978-1982, the co-operative movement seems to have performed poorly as the level of active societies appears to have fallen from 63% in 1978 to 40% in 1982. There was a corresponding drop in membership from 58-56%, and that a staggering 44% of all co-operators, in the district could be termed as either semi-active, dormant or were under liquidation. The plan heaped blame on poor financial management by co-operators, coupled with non-availability of adequately trained manpower to satisfactorily handle the extension services for the promotion of the co-operative movement. Apparent in this analysis is therefore the generally poor co-operative movement in the district as a whole, of which the Nzoia farmers co-operative society is also part.
The farmers interviewed in the scheme observed that on the whole, the Nzoia Farmers Co-operative Society’s management was rated as inefficient (58 farmers). Thirty-two other farmers rated the management as either fairly efficient or just efficient in their work; while 10 farmers reported that they were less concerned about how the co-operative was run.

The Kakamega District Development Plan, (1984-88:21) observed that there were three out of eleven water projects in the district under the Ministry of Water Development, that were highly over-utilized. Although these were not named, the findings from the Nzoia scheme study highly tend towards this observation. The Nzoia scheme is served by the Nzoia water system that was made operational as from 1972. This water system appears to have been expanded to serve other areas in the other scheme and privately owned farms in the region. It was however clear from the study that with time, there has been increased water shortages to individual farms, to the extent that presently, some farmers reported having had no water for the last five years and over. Presently there were only 38 farmers who reported that they get water on their farms either occasionally or full-time. The rest of the farmers (62) reported problems of extreme shortages and inadequate supplies, that they could only take recourse to Nzoia River, for those who had farms nearby, and some small streams and springs with untreated water. Even those who reported having water in most times, sometimes this was never available in sufficient quantities for human and livestock consumption. Such farmers were then also compelled to water their animals some kilometres away.
There were a total of 33 farmers who reported watering their animals up to half a kilometre away. Another 36 watered them a kilometre away; while 11 others watered their livestock between one and half kilometre and three kilometres away. There were seven farmers who had dug boreholes on their farms from which water requirements were met both domestically and for their livestock consumption. There were only 12 farmers who reported having no major problems with water supplies, while one farmer never stayed on the farm presently.

There is then a general finding that the Nzoia scheme has a water problem at present, and which is a vital resource component in successful dairy farming development in any region in Kenya. Chitere (1976:23) had observed that farmers in the non-scheme areas of Kakamega District had been required to meet the conditions of having fenced, and if possible paddocked the farm and made sure that water was available on the farm, before they could be allowed to rear grade dairy cattle. There had thus been seen the need to restrict the movements of the animals in a bid to limit possible death risks due to the prevalence of ticks, and hence tick-borne diseases. This is contrary to our findings in the Nzoia scheme, where, apart from dipping, animals have also to move, (for some farmers) long distances in search of drinking water. It is also surprising that some farmers in the scheme reported not to have paddocked their grazing land, or in other instances had allowed fences to break, allowing free movement of their cattle.
As relates to dip services, all the farmers in the scheme interviewed reported at least dipping their cattle, once in a week. There were only four operational plunch dips serving the public here. However, our findings indicate that these dips are inadequate, especially in terms of being located far-off places from most farmers. There were eight farmers who reported that they no longer use the four public dips, but rather spray their cattle on the farm individually. Forty farmers reported dipping their cattle up to a distance of a kilometre away from their farms. Another thirty-seven travelled up to two kilometres away. Eight farmers reported making journeys up to three kilometres away. This clearly indicates that there is a big problem with dipping services in the scheme. This, especially looked at in terms of total distance, travelled to and fro such dipping centres, means a lot of valuable time is lost by the cattle, instead of grazing and hence generally reduced milk yield for that day. This would also apply to travels to A.I. centres and to watering places, and especially for the latter where animals would already be thirsty again by the time they arrive back on the farm.

Our findings tally with those of the Kakamega District Development Plan (1984-88:29) which had observed that there was generally an insufficient number of dips in the district for adequate disease control, and that also there was lack of funds to maintain and operate all dips in the region. Indirectly, this meant occasionally there would be no funds to purchase acaricides to replace the old ones in the dips, and hence reducing the
effectiveness of tick, and therefore, disease control. Since grade dairy animals are quite vulnerable to diseases, more so tick borne, the poor quality dips would be the unmaking of most farmers' success at grade dairy farming development. This might explain why, as had been seen earlier, there has tended to be an increase in resort either to keeping zebu or zebu-crossed cows which were reported to be more hardy and/or resistant to most tick-borne diseases. Stotz (1977:8) found that tick-borne diseases were responsible for the death of 40 - 50% newly purchased grade dairy cows participating in the 'Dairy Enterprise Recording Scheme,' despite fact that most farmers owned cattle sprays and actually used them. On the other hand, Hopcraft (1976:49) had also found that 35% of all heifers participating in the A.I. scheme died before their first calving, and that 80% of these died of tick-borne diseases.

Odingo (1967:141) had observed that generally, the aim of settlement schemes is usually regarded by governments as a more toward solving rural population pressure, as well as providing employment to landless and the unemployed. However, we should here add that the farmers to join the scheme should also be knowledgeable enough about the aims of the scheme. Generally the farmers in the Nzoia scheme believed that they were settled in the Nzoia scheme as they were landless; to increase agricultural production thereafter; and provide sources of income to them. There were however 12 farmers who reported that they never knew nor understood any aims of their settlement on the scheme.
On the basis of these aims, the farmers were asked to rate their comparative individual performance, and generally in the scheme as a whole. Individually, 25 farmers reported to be doing quite well; 19 farmers were not quite satisfied with their performances; 18 farmers reported that at least they produced beyond their subsistence needs; 13 farmers reported that they were financially constraint to do better; 7 farmers thought they at least owned land now; 5 farmers reported inadequate capital while one farmer said he had land now and produced beyond his subsistence needs. The other 12 farmers who never understood the aims of settlement were not asked to rate themselves.

On the general rating, 23 farmers believed other farmers were constraint with inadequate capital; 29 farmers saw that most farmers produced at least beyond the subsistence needs; 20 farmers reported that most of other farmers were doing quite well; 7 farmers believed that other farmers had now land; 6 believed those who do not do good farming lack proper planning; while 3 other farmers held that they had no idea of the performance of other farmers (see tables 29 and 30 below).
Table 29: Individual farmers ratings of their performance in relation to the aims of settlement by the government:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Number of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doing quite well</td>
<td>25</td>
</tr>
<tr>
<td>Not quite satisfied with their performance</td>
<td>19</td>
</tr>
<tr>
<td>Producing beyond their subsistence needs</td>
<td>18</td>
</tr>
<tr>
<td>Having financial constraints</td>
<td>13</td>
</tr>
<tr>
<td>Have land now</td>
<td>7</td>
</tr>
<tr>
<td>Have inadequate income from farming</td>
<td>5</td>
</tr>
<tr>
<td>Producing beyond subsistence and has land</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>88</strong></td>
</tr>
</tbody>
</table>

Table 30: The farmers ratings of the general performance of other farmers in the scheme.

<table>
<thead>
<tr>
<th>General Rating</th>
<th>Number of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most produce beyond their subsistence needs.</td>
<td>29</td>
</tr>
<tr>
<td>Some farmers lack adequate development finance.</td>
<td>23</td>
</tr>
<tr>
<td>Most farmers do quite well</td>
<td>20</td>
</tr>
<tr>
<td>Farmers have land now</td>
<td>7</td>
</tr>
<tr>
<td>Some lack proper planning</td>
<td>6</td>
</tr>
<tr>
<td>Have no idea</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>88</strong></td>
</tr>
</tbody>
</table>
On the whole, the farmers interviewed believed that those farmers whose production capacities dispersed from the government's aims of creating the settlement scheme could be helped in the following ways. 22 farmers believed there was need to provide more extension advice to the farmers on the general farming, but more so in dairy farming development. 32 farmers wanted a more flexible source of development capital, for instance more grace periods or waiving of loans in cases of crop-failures etc. 12 farmers wanted more loans and increased extension service; 3 farmers wanted an increase particularly in dairy advisors; while one wanted the government and/or the National Cereals and Produce Board to be paying farmers more promptly on delivery. There were 17 farmers who thought they were good farmers and with no much problems. However, 13 others could not provide any solutions for their under performance remedy.

The farmers interviewed were also asked to give the various problems they presently faced in their dairy farming, and those they thought affected the rest of the farmers and the scheme in general. It was our realisation that most of the individual and general scheme problems were not quite different.

These reported problems revolved around the areas of management; development capital; extension services and other encilliary services. The management problems were seen in terms of frequent cattle deaths, inadequate dairy farming knowledge, lack of qualified dairy farming workers; other farmers unhealthy animals, inadequate pastures on
a land dispute. The development capital problems were in terms of lack of or inadequate funds, expensive cattle drugs and inadequate land. The extension services problems were inadequate, corrupt and discriminatory veterinary services (where one farmer reported that the veterinary personnel first serve those farmers they know have ready cash to pay for the drugs, leaving the poor farmers' animals to die by the time they think of now serving them), unreliable and/or inadequate A.I. services, uncontrolled cattle mating in the scheme (sometimes from low quality bulls), no dairy farming advisors, inadequate cattle drugs sometimes. The problems with the ancillary services were irregular, inadequate, poor or no water supplies; inadequate, ineffective, poor dipping facilities; frequent cattle diseases, poor tick control measures, poor/inadequate feeder roads in the scheme, far-off collection centres for milk, unqualified dip attendants and bad mixing of dip acaricides.

Most farmers in the scheme reported more inclination towards doing better dairy farming in future, although there was no indication how some of the hitches would be overcome, more so financial and animal husbandry problems. In their future plans, 23 farmers aimed at rearing more milk cows and plant more pastures; 18 other farmers wanted to establish more pastures on their farms. There were ten farmers who wanted to increase their livestock numbers only; 10 farmers wanted to reduce arable farming and devote more land to dairying; three farmers had plans for a dairy loan to rear more cows; two farmers had plans for more cows and were building their own plung dip; 2 others wanted more cows and water pump on the farm. The future plans for 23 farmers were:
borehole on the farm, rear more cows and plant more pastures; one farmer reported need for a water pump and more pastures, while another had plans to purchase a pure grade dairy bull and establish more pastures, and yet another was to reduce arable farming and acquire a development loan.

The other 27 farmers had either no immediate future plans or were unwilling to make any changes, unless the government provided services such as A.I., veterinary services and water supplies were drastically improved. But on the whole, most farmers interviewed were willing to make changes, some quite drastic, and it would be up to the extension services to take advantages of such forward sightedness of most farmers to improve the quality of farming in the scheme, and hence the farmers standards of living.

4:2: INFERENTIAL DATA ANALYSIS

This section of chapter four analyses the statistical relationships between the dependent and the independent variables that were used in the hypotheses around the study. There were four major hypotheses. The inferences will be made in terms of the linear correlation and regression coefficients.
HYPOTHESIS 1: Higher amounts of income to a farmer leads to more investment in milk production.

Table 31: The relationship between income amounts to a farmer and possible investments in milk production during the dry seasons.

<table>
<thead>
<tr>
<th>Variables</th>
<th>R. Square</th>
<th>Simple R</th>
<th>B</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly income</td>
<td>0.80231</td>
<td>0.89572</td>
<td>0.00038</td>
<td>1.02980</td>
</tr>
<tr>
<td>Monthly income</td>
<td>0.82453</td>
<td>0.38325</td>
<td>-0.00006</td>
<td>-0.014765</td>
</tr>
<tr>
<td>Additional income</td>
<td>0.82697</td>
<td>0.51258</td>
<td>-0.00003</td>
<td>-0.07580</td>
</tr>
</tbody>
</table>

The income amounts were the independent variables, while the dependent variable was the amount of milk, measured in kilogrammes. The yearly income was computed from the total sales from maize and milk production. This included the highest yearly totals and the lowest totals to individual farmers. The correlation coefficient indicated that these two are highly correlated and virtually the same hence the use of just 'yearly income' amounts is adopted here. The table above shows that this income from agricultural enterprises is highly correlated with the amounts of milk a farmer produces in the dry seasons. The monthly income and additional income sources explain very little of the variation in milk production in the same seasons.
In all, the three independent variables explain 82% of variation. This is quite a high percentage and may be attributed to the fact that dairy farming as an enterprise requires a lot of capital input, such as in supplementary feeding and other emergencies as treatment. The residual variation not explained by the three independent variables may be due to other independent variables not included in the study, or due to the measurement and/or sampling errors. Partially therefore, this part of our analysis is in accord with our hypothesis that higher levels of income to a farmer leads to more investments in larger quantities of milk produced on the farm. The best predictor here is yearly income (0.00038), followed by monthly income (-0.00006).

Table 32: The relationship between income amounts to a farmer and possible investment in milk production in the wet seasons:

<table>
<thead>
<tr>
<th>Variables</th>
<th>R - Square</th>
<th>Simple R</th>
<th>B</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly income</td>
<td>0.67307</td>
<td>0.82041</td>
<td>0.00048</td>
<td>1.14468</td>
</tr>
<tr>
<td>Additional income</td>
<td>0.77437</td>
<td>0.31122</td>
<td>-0.00016</td>
<td>-0.32799</td>
</tr>
<tr>
<td>Monthly income</td>
<td>0.79243</td>
<td>0.23970</td>
<td>-0.00009</td>
<td>-0.18608</td>
</tr>
</tbody>
</table>

The three independent variables, as in table 31 still remain. The dependent variable here is the amount of milk produced in the wet seasons. It can be observed that the same nature of the
relationship between the variables is reflected almost in the same manner, only that here, the coefficients are lower. The only difference is that additional income sources (off-farm) explain more of the residual variance after the yearly income, compared to that explained by monthly income. In this case, it is the best second predictor of the change in the dependent variable, after the yearly income (i.e., -0.00016 and 0.00048 respectively).

The slightly lower coefficients in table 32 may be explained by the fact that in the wet seasons, there is generally more abundantly available pasture. This may mean less effort is needed from the farmers in terms of the possible investments in food supplements to offset pasture shortages. These findings also support our hypothesis.

In general, our findings (table 31 and 32) are in line with those of Pollard (1980:580) who found that there was not a strong relationship between gross output and the off-farm sources of income. He concluded that in most cases, off-farm businesses are essentially for survival. But in our case, as contrasted with Pollard's findings, farmers with supplementary off-farm occupations produced maize and milk farm outputs better than those farmers who had none. We are, however, in agreement that most farmers with salaried monthly incomes were generally worse off than full-time farmers with or without off-farm incomes. Pollard (1980) in the same light indicated that some employments necessitated long periods of absence from the farm
(such as teaching or other public service occupations which are mainly full-time, and sometimes outside one's own district). The author concluded that there was evident tendency of most farmers either never to recognize that farming required their full-time energies; or else had belief that such attention will not yield satisfactory income levels. We observed a few cases of farmers who had 'abandoned' their farms, having left them only to inexperienced and untrained workers in animal husbandry management.

In short, it is our contention that despite the foregoing discussion, the levels of income accruing to a dairy farmer is crucial in sustaining and upgrading his animal husbandry practices. Russel (1960: 21-22) observed that British farmers were faced with inadequate capital which was required in construction of cow-sheds, buildings, water supplies, electric light, labour for dairying which involved seven days, problems of disease control, and cow feed stuffs production (such as hay and silage production). In the same light, George and Chokshi (1977:28) also found that most investments made by farmers in dairy farming consisted of the purchases of cattle, construction of cattle sheds and buying of equipment needed for cattle keeping, and animal feeds.

The crucial need of higher income levels to a farmer is also exemplified in the observations by Chitere (1976:39-40) about farmers being faced with increasing costs of dairy grade animals and agricultural inputs, such as feeds and fencing materials. This meant an initial higher capital outlay and maintenance costs of keeping a
grade dairy animal were inevitable. For the farmers in the Nzoia scheme, most of the initial capital was provided for by loan, including grade dairy cattle (average five animals) and equipment and fencing material. Crucial at their disposal would thus be the capacity of maintaining high quality dairying on the farm. This no doubt requires a lot of financial investment, such as replacing the old and degenerated stock with new and high quality ones.

It was in this same light that Rogers and Shoemaker (1971) pointed out that though the relative advantages of an innovation (grade dairy farming) may be high, its adoption rate maybe slow if it entails high initial or maintenance costs (Chitere, 1976:40). They saw, then, quite the need for incentives, such as subsidies or credit as a vital component to overcome this problem. Most farmers in the Nzoia scheme reported experiencing increased problems with high costs of dairy inputs, such as in treatment costs and supplementary feeds. Implicitly, this may mean that their income levels were low or that other demands on their financial resources were too many. The consequence has been a gradual decline in the levels of animal husbandry practices from most farmers. Such farmers have appeared to be continually unable to maintain the 'ideal' standards of grade dairy farming in general.

This declining standards of animal husbandry practices has been gradual, over the period since farmers settled in the scheme. This may be partly the reason why some farmers, as we saw earlier, have
tended to resort to the less demanding zebu or 'zebu-crossed' milk animals. Rogers and Shoemaker (1971) held that in some instances, especially in the agricultural enterprises, once the subsidies or incentive is withdrawn, the adoption of the innovation usually stops (Chitere, 1976:43). That this was because the receivers perceive the incentive as separate from the intrinsic relative advantage of the innovation. It would have therefore been worthwhile for the government to have continued the 'loaning' to the farmers in the Nzoia scheme, to such a time that they could be well established in dairy farming development.

However, it is interesting to note that despite the observed influence income has on dairy farming, the age of the farmers is more crucial in keeping the quality of the animal breed. Age thus pre-empts and is highly correlated with the nature of the animal condition that was found on the individual farms (see table 33). However, it should be understood that in social research, age appears to correlate highly with any other variables it is correlated with. This is why in the findings in the table below, financial assistance from children is a better predictor (-0.22449) of the likely animals' condition on the farms. In this case, a unit change here leads to greater change in the animal conditions, compared to any other independent variables in the table.
In all, the independent variables (age, yearly income, monthly income, financial assistance from children, and additional income sources) explain about 85\% of the variation in the quality of breeds of animals. Age explains about 67\% of the variation, while yearly income is the next most important variable explaining the residual variance in the quality of animal condition, though negatively correlated (-0.31476). This realisation may implicitly shed light on the fact that the amount of yearly income indicates the performance levels of the farmers, and hence their quality of dairy cattle. The other variables are positively correlated, but their contribution to the explanation of the variation is not significant. This part of our analysis also supports our hypothesis, in farm level investment in milk production, in this case to be reflected in better quality...
Table 34: The influence of age, yearly income monthly income, financial assistance from children and additional income (independent variables) to those farmers whose dairy cattle breed quality was reported as being "maintained"

<table>
<thead>
<tr>
<th>Variables</th>
<th>R - Square</th>
<th>Simple R</th>
<th>B</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.67348</td>
<td>-0.82066</td>
<td>-0.13802</td>
<td>-0.79045</td>
</tr>
<tr>
<td>Yearly income</td>
<td>0.73382</td>
<td>0.31476</td>
<td>0.00001</td>
<td>0.57198</td>
</tr>
<tr>
<td>Monthly income</td>
<td>0.84357</td>
<td>-0.01473</td>
<td>-0.00001</td>
<td>-0.26103</td>
</tr>
<tr>
<td>Financial Assistance from children</td>
<td>0.84932</td>
<td>-0.31623</td>
<td>0.22449</td>
<td>0.14198</td>
</tr>
<tr>
<td>Additional income</td>
<td>0.85526</td>
<td>-0.31008</td>
<td>-0.00001</td>
<td>-0.21795</td>
</tr>
</tbody>
</table>

In this case again, the coefficients are equally high, only that the relationships differ. Age is negatively correlated at -0.82066, while yearly income at 0.31476. The other independent variables are also negatively correlated with the dependent one, thus a maintained breed quality. Financial assistance from children is still the best predictor of the changes in the dependent variable (0.22449).

In general, these findings tend towards those of George and Chokshi (1977:17). Chitere (1976:95) however on the contrary found that off-farm income sources were significantly related to the farmers performance at the individual farm level. This difference may be explained, in our case, by the fact that there were very few farmers in the overall sample who had off-farm sources of income,
and which had no direct relationship with investment in milk production.

The discussions in this part about the findings lean generally towards our hypothesised relationship between income levels and investment in dairy farming. This in this case was seen in the amount of milk produced at the individual farm level, and the quality of animal breed condition.

HYPOTHESIS 2: The Intensity of the penetration of the extension service (at the individual farm level) and how the related animal husbandry advice in dairy farming is received has a relation to the amount of milk produced by a farmer.

Table 35: The relationship between the reported sources of extension service information (independent variables) and the amount of milk produced in the dry season on individual farms.

<table>
<thead>
<tr>
<th>Variables</th>
<th>R - Square</th>
<th>Simple R</th>
<th>B</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>No training in dairy farming</td>
<td>0.24556</td>
<td>-0.49554</td>
<td>-5.04012</td>
<td>-0.32181</td>
</tr>
<tr>
<td>Attendance of A.S.K. shows</td>
<td>0.29193</td>
<td>0.42568</td>
<td>3.75302</td>
<td>0.21765</td>
</tr>
<tr>
<td>Non-reading of agricultural Newspapers</td>
<td>0.30699</td>
<td>-0.34293</td>
<td>-2.27725</td>
<td>-0.11954</td>
</tr>
<tr>
<td>Listening to agricultural Radio Programmes</td>
<td>0.30997</td>
<td>0.27501</td>
<td>0.96000</td>
<td>0.06132</td>
</tr>
</tbody>
</table>
The table above indicates that lack of training in dairy farming for farmers explains more of the variation in the amount of milk produced (dependent variable), 24%. Even then, these variables are negatively correlated (-0.49554), and is not the best predictor of the variation in the dependent variable (-5.04012), compared to listening to radio programmes (0.96000). The attendance of national agricultural shows is more positively correlated (0.42568) with the quantity of milk produced in the dry seasons on individual farms. This may be explained from the fact that such shows are mainly practically oriented, such as in providing information on zero-grazing of dairy animals. Such practical observations are likely to be adopted by farmers who frequent such shows in most years.

The non-reading of agricultural related literature is negatively related to it, (-0.34293), while though positive, listening to radio agricultural programmes is not significant (0.27501). In general these independent variables explain about 30% of the variation in the dependent variable. This is not surprising, because dairy farming as an agricultural enterprise is quite precarious, and its success is dependent on many other influencing factors. For instance whether a farmer has the know-how through training, reading agricultural related newspapers or attending agricultural shows to gain more dairy farming information, this may not be translated into reality at the farm level due to lack of development capital, poor attendance from veterinary staff, inadequate water supplies or even poor marketing facilities.
The table 36 below shows that the coefficients for the correlation of the same independent variables on the amount of milk produced during the wet seasons is relatively lower. Non-training in dairy farming explains 19% of the variance in the dependent variable, but even then it is negatively related at -0.44113. It is the listening to agricultural radio programmes and attendance of agricultural shows that are positively and modestly correlated to the dependent variable (0.32789 and 0.37890 respectively). However, in this table, the lack of training in dairy farming is the best predictor of the unit changes in the dependent variable.

Table 36: The relationship between the reported sources of extension service information (independent variables) and the amount of milk produced in the wet seasons (dependent variable) on the individual farms.

<table>
<thead>
<tr>
<th>Variables</th>
<th>R - Square</th>
<th>Simple R</th>
<th>B</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>No training in dairy farming</td>
<td>0.19460</td>
<td>-0.44113</td>
<td>-6.03526</td>
<td>-0.26520</td>
</tr>
<tr>
<td>Listening to radio agricultural programmes</td>
<td>0.23823</td>
<td>0.32789</td>
<td>3.34361</td>
<td>0.14699</td>
</tr>
<tr>
<td>Attendance of agricultural shows</td>
<td>0.25898</td>
<td>0.37890</td>
<td>4.18659</td>
<td>0.16710</td>
</tr>
<tr>
<td>Non-reading of agricultural related literature</td>
<td>0.27022</td>
<td>-0.33947</td>
<td>-3.404149</td>
<td>-0.12289</td>
</tr>
</tbody>
</table>
The non-reading of agricultural related literature is also modestly related, but negatively (-0.33947). In all, the four independent variables explain about 27% of the variance in the dependent variable. This percentage is also attributed to some of the explanations made a while ago. These findings do not provide a strong basis for upholding our hypothesis, at least, up to this extent. As we had seen earlier, the realisation may be that the extension service information sources per se do not matter a lot. What looks relatively critical in such incidences is the very realisation that such should be considered wholly as part of the overall extension service package, to be integrated with such other services as credit facilities and improved marketing. In this case, each component part of such a package is equally desirable, in our case, in the general improvement in dairy farming development at the individual farm level.

These findings are concurrent with those of a similar study by Pollard (1981:574) who also found a small positive association between communication exposure (extension service media) and the performance of farmers. This performance in our case could be exemplified in the quantity of milk produced and supplied for sale. The author had in fact found that people with non-agricultural background did better at farming than those with limited prior farming experience, and those who had always been engaged in farm work (Pollard, 1981:581).
In line with these findings, Chitere (1976:100-102) concluded that attendance of agricultural courses does not necessarily lead to successful farmers performance (at the individual farm level). The same case was also observed in the case of listening to agricultural radio programmes.

Table 37 below shows the nature of relationship of "degenerated" quality of animal condition (breed) with extension service communication and other socio-economic attributes of the farmers.

Table 37: The relationship between "degenerated" animal breed quality (dependent variable) and sources of extension service information and other farmers' individual attributes (independent variables).

<table>
<thead>
<tr>
<th>Variables</th>
<th>R - Square</th>
<th>Simple R</th>
<th>B</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>No dairy training</td>
<td>0.07507</td>
<td>-0.27399</td>
<td>-0.27723</td>
<td>-0.28369</td>
</tr>
<tr>
<td>Husband's education</td>
<td>0.13118</td>
<td>0.19325</td>
<td>0.00455</td>
<td>0.22146</td>
</tr>
<tr>
<td>Listening to radio Programmes</td>
<td>0.13578</td>
<td>0.19184</td>
<td>0.06106</td>
<td>0.06248</td>
</tr>
<tr>
<td>Non-use of A.I.</td>
<td>0.13929</td>
<td>0.04442</td>
<td>0.28330</td>
<td>0.27879</td>
</tr>
<tr>
<td>Use of A.I. service</td>
<td>0.15123</td>
<td>0.04034</td>
<td>0.26707</td>
<td>0.25321</td>
</tr>
<tr>
<td>Wife's education</td>
<td>0.15348</td>
<td>0.00311</td>
<td>-0.00562</td>
<td>-0.04560</td>
</tr>
<tr>
<td>Non-reading of agricultural related literature</td>
<td>0.15358</td>
<td>-0.11276</td>
<td>0.01496</td>
<td>0.01227</td>
</tr>
</tbody>
</table>
The table shows that for those farmers whose dairy animals were found to have 'degenerated' in breed quality, lack of training in dairy farming explained more of the variance in this dependent variable. Though, this is not much (7.5%), and is negatively correlated at an insignificant -0.27399. The education standard of the husband explained more of the residual variance, but was also weakly correlated at 0.19325. In all the dependent variable's variation is explained by about 15% by the independent variables.

However, it is realised that the availability and use or not of the A.I. services was a more better predictor of the quality of animal condition here. This is so from the fact that in the absence of the service, most farmers reported resorting to use of inferior quality breeds of bulls, such as owned by neighbours. But in general, the conclusion here is that the condition of the dairy animals as was found depends greatly on many more factors than was analysed in the study. In this case, there appears a possibility of a wide spectrum of factors and conditions, at the individual farm level, which explain the nature of the animal breed quality as was seen. In this case again, the findings fall below upholding our hypothesis. For the purposes of this study thus, we consider that the quality of animal breed is related to the quantity of milk production at the individual farm level. High quality breeds of grade dairy cattle are assumed to be more healthy, and thus likely to produce larger quantities of milk supplies.
In the case of the farmers who were found to have relatively 'maintained' the breed quality of their grade dairy cattle, non-reading of the agricultural newspapers accounted for 10% of the variation in the dependent variable (quantity of milk produced). This was however negatively correlated (-0.31897) (see table 38 below). In all, these independent variables explain about 19% of the variation in the dependent variable, and are generally weakly correlated. Here, the best predictor of the breed quality is the lack of training in dairy farming by farmers (-0.14246), followed by non-reading of agricultural related literature (-0.13503), and non-use of A.I. services (0.12246).

Table 38: The relationship between maintained breed quality (dependent variable) and the extension and other farmers individual attributes:

<table>
<thead>
<tr>
<th>Variable</th>
<th>R - Square</th>
<th>Simple R</th>
<th>B</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-reading agricultural literature</td>
<td>0.10174</td>
<td>-0.31897</td>
<td>-0.13503</td>
<td>-0.13760</td>
</tr>
<tr>
<td>Wife's education</td>
<td>0.13468</td>
<td>0.27050</td>
<td>0.02158</td>
<td>0.21823</td>
</tr>
<tr>
<td>No dairy training</td>
<td>0.17239</td>
<td>-0.29883</td>
<td>-0.14246</td>
<td>-0.17666</td>
</tr>
<tr>
<td>Non-use of A.I. services</td>
<td>0.18044</td>
<td>0.05240</td>
<td>0.12246</td>
<td>0.14627</td>
</tr>
<tr>
<td>Non-listening to radio Agricultural programmes</td>
<td>0.18672</td>
<td>-0.23683</td>
<td>-0.06518</td>
<td>-0.08045</td>
</tr>
<tr>
<td>Age</td>
<td>0.18795</td>
<td>-0.01392</td>
<td>0.00127</td>
<td>0.02953</td>
</tr>
<tr>
<td>Attendance of shows</td>
<td>0.18955</td>
<td>0.025623</td>
<td>0.05940</td>
<td>0.06612</td>
</tr>
<tr>
<td>Husband's education</td>
<td>0.19003</td>
<td>0.22653</td>
<td>-0.00386</td>
<td>-0.03868</td>
</tr>
<tr>
<td>A.I. services Use</td>
<td>0.19039</td>
<td>0.00433</td>
<td>0.03838</td>
<td>0.04409</td>
</tr>
</tbody>
</table>
This analysis does not support our general hypothesis, mainly for reasons already seen elsewhere.

This study also attempted an analysis of possible explanations why farmers reported either using the A.I. services or not. It is quite interesting to note that consideration of the quality of the A.I. service was a crucial factor in its use or not. The quality of the services as was considered by the farmers in the scheme explained 33% of use or non-use of the service. On the other hand while consideration of the quality of the service by farmers is significantly correlated at 0.57942 with non-use of A.I. service, the use of A.I. services is negatively correlated at -0.57942. In this case, farmers who consider such services in the scheme as below standard do not use them, as contrasted to those using it, whose quality consideration never mattered, in this case.

This divergence may be largely explained in terms of the proximity to the service centres themselves from the individual farmers. The non-use of the service is significantly correlated with the distance (0.43292), though the quality of the service is still the best predictor (0.33824) in the variation of the use of the service by farmers. In this case, with poor services, farmers far away from such A.I. service centres are more likely to be disillusionsal faster compared to those staying relatively nearer. In any case, most of those farmers who considered the A.I. service as relatively adequate resided closer to these service centres. The other independent variables (listening or not to radio programmes,
ages of the respondents, reading agricultural newspapers and husband's education) are insignificantly related to the decisions for the use or not of the A.I. services in the scheme.

The foregoing discussion tends towards those in a similar study by Chitere (1976:93) who found only a moderate association between education and the farmers performance (in our case use or not of the A.I. service here). He saw that there was no significant association between agricultural course attendance (or training) and the farmers performance. However, in our case, it has to be considered that the nature of our findings reflect the fact that there was almost no extension services in the scheme related to dairy farming development. The farmers would be assumed to merely be employing their own meagre know-how they attained during their induction courses or through attending agricultural shows; or through their own perceptions of the best way to do dairying. This would be one reason why we found quite a significant number of farmers as generally poor managers in dairy farming.

In summary, therefore, our realisation from the findings generally negate our overall hypothesis about the significance and availability of the extension service programme. On the other hand, this may be due to the fact that we generally found very little of extension services in the scheme, so that even some of the best farmers were not the most frequently visited by the extension service personnel.
HYPOTHESIS 3: The Production of milk far above the subsistence requirements correlates to dairy farming enterprise as the major activity at the individual farm level.

The assumptions made in this case were that the quantity of milk a farmer delivered for sale was in excess of the household requirements. However, this may not be quite the case generally, as some farmers reported using their evening milk stocks for subsistence purposes. But for the purposes of this study, our assumptions will be upheld, in an attempt to relate whether the quantity of milk levels a farmer produced and delivered to the market were related to dairy farming as the major enterprise on the farm (see table 39).

Table 39: The relationship between dairy farming as a major activity (independent variable) and the amount of milk offered for sale in the dry seasons (dependent).

<table>
<thead>
<tr>
<th>Variable</th>
<th>R - Square</th>
<th>Simple R</th>
<th>B</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of acreage devoted to major activity</td>
<td>0.32852</td>
<td>0.57317</td>
<td>0.39365</td>
<td>0.52243</td>
</tr>
<tr>
<td>Dairying as major activity reported on farm</td>
<td>0.49365</td>
<td>0.47041</td>
<td>6.57055</td>
<td>0.41360</td>
</tr>
</tbody>
</table>

These two variables explain about 49% of the variation in the dependent variable, but significantly correlated. However, the best predictor is whether dairy farming was reported as the major
activity being undertaken on the farm (6.57055). In this case, a unit change in dairy farming as a major activity leads to far greater changes in the quantity of milk supplied for sale.

In the wet seasons, the coefficients of the findings are relatively the same, at 0.57317 and 0.408284. These variables explain 43% of the variation in the dependent variable. This is also best predicted by dairy farming as the major activity on the farm (7.97038). In the same light, this is even supported by the fact that the amounts of milk supplied to the market in the dry seasons is negatively correlated to arable farming as the major activity on the farm (-0.47041), which explains 22% of the variance. The same tendency is reflected in the wet seasons, with correlation at -0.40284, and explaining variance by about 16% in the dependent variable.

These findings lead us into confirmation of the observed tendency for most farmers in the scheme to engage in the extensive nature of dairy farming. It is therefore crucial that to produce more milk, there will be need for larger pasture fields for cattle grazing, more so in the dry seasons. The available data therefore support our hypothesis, and thus upheld significantly. The fact that the amount of milk produced for sale is greatly related to dairy farming as the major activity, and the amount of acreage devoted to it, tends towards observations made by George and Chokshi (1977:2). They saw that it was imperative for farmers to make three major decisions. How much to invest in dairying; what kind of milk production
practice to adopt (extensive or intensive); and how to utilize the milk produced at home. In this case, the degree of investment in dairying will be in line with the quantity of milk desired to be produced, either for marketing or just for the subsistence needs. This sheds light, in our case, and as the farmers mainly practiced extensive nature of cattle grazing, on the above decisions and why there are differences in consideration for what is the major activity on individual farms.

There had also been the need in this part to establish the pattern of decision making on the farm and the amounts of milk produced at farm level. In this case, the findings indicate that there is no significant difference in who actually makes the decisions about farm production practices. However, the best predictor was decision making by the husband (5.08333), followed by joint decision between husband and wife (4.66071).

HYPOTHESIS 4: The larger the number of dependents to each household, the greater the drain on financial resources, and thus the less there is to invest in milk production.

This hypothesis was analysed in terms of the number of children and other dependents to a farm household, the financial drains through school fees and other related payments, as affects the amount of milk supplied to the market in the dry and wet seasons. The same were also analysed in terms of their likely effect on the quality of the dairy cattle breed kept on the farm. The assumption was that farmers with less financial burdens were likely to be in a
better position to keep better quality cattle breeds, deriving from the ability to purchase additional food supplements and greater attendance to the health of animals more easily.

Interestingly however, the amounts of milk produced and supplied to the market in dry seasons appears to be only insignificantly related with the family size and the supposedly financial drains. The amount of fees payments is weakly correlated at 0.26557. The number of dependants is on the other hand negatively correlated at -0.07123 (though it has better prediction of the variation - thus -0.19965). These two independent variables account for 9% of the variation in the dependent variable.

In the wet seasons, they account for a mere 3% of the variation, and are highly insignificantly correlated, at 0.13306 and -0.05155 respectively. Here again, the best predictor of the variance in the dependent variable is the number of dependents (-0.34790) followed by the number of children (0.32898). The dependents in this case includes all the children born to the household, and other relations dependent on the head of the household for social, economic and other kinds of support. The number of children in the household in this case does not also seem to be quite a burden, very insignificantly correlated at 0.03418. In short therefore, financial drains due to school fees and other economic support has no relation to milk produced and supplied for sale. The hypothesis, up to this part, is thus discounted and rejected.
However, for farmers who reported their animal breeds as being "highly degenerated", there is also a weak (0.25189) correlation with the number of children in the household. This is the best predictor of the variation in the reported breed quality (0.01449). The dependants number also tends towards the same correlation, at 0.23760; but the amount of fees payments is trivial (0.04645) and has no prediction (0.00000).

For farmers who reported their cattle breeds as "fairly degenerated", the number of children, fees payments and total dependents were all negatively correlated (-0.20970; -0.17895; and -0.11193 respectively). The best predictor here for the variance in the dependant variable is the number of children (-0.02353). The three independent variables in this case account for 5% of the variance in the dependent variable.

There is trivial relationship between the amount of fees payments (0.15199), the number of dependents (-0.07328), and the number of children (0.06144) with the quality of cattle breed reported as just "degenerated." The best predictor independent variable here is the number of household children (0.02486), and then the total number of dependents (-0.02239). The three variables also account for 5% of the variance in the dependent variable.
In the case of those farmers who reported as having relatively maintained the breed quality of their dairy cattle, the amounts of fees payments correlated at \(-0.07877\); the number of dependents at 0.06208 and the number of household children at 0.000785. The three independent variables accounted for only 1% of the variance in the dependent variable. This animal condition is best predicted by the total number of dependents to a household (0.00812), followed by the total number of children (-0.00487).

These findings also prove that the quantity of milk produced at farm level (assumed to be related to the nature of animal breed quality reported) is not affected significantly by financial drains by dependents and household children. The hypothesis is thus generally rejected altogether.

These findings run counter to earlier observations by Hunter (1969:37) who concluded that (in most instances) most of cash available to peasants will one way or another be needed by a relative or go into the payment of school fees. In the same light, Higgins (1959:46) also saw that high fertility was a depressive factor on the private saving. However, some of our findings concur with George and Chokshi (1977:34) who found that milk sales patterns was not related to the number of children in the family or family size. They saw that family income was not a major variable in influencing the proportion of sales. That rather, the major factor which affected the quantity of milk marketed was (simply) the level of production.
A possible induction, in our case, may derive from the realisation that the majority of the farmers in the scheme made very little tangible investments in the production process in dairying. And hence the reason why the financial constraint is not explicitly manifested here, giving the whole analysis a less significant relationship.

However, Pollard (1981:584) found divergent relationships, that there was an association between larger families and lower output. He saw that this was because the extra assistance expected (as labour force) was more than counteracted by the financial drain providing for the family, and (thus) reducing investment potential. A large family was therefore quite a burden on the farmer's overall performance.
In this chapter, the major preoccupation involved making conclusive deductions about the discussions in the previous chapters. These had shed light on some of the critical policy considerations regarding rural development problems. It was seen that problems of rural development are either at the individual farm level or regional level and, therefore, of public concern.

In our case, this forms the basis of rural development differentiation among the farming communities, whether under relatively homogeneous conditions or otherwise.

This study sought to establish the various socio-economic factors which could help explain the differential capacities at farm performance generally, and more specifically at abilities to sustain and enhance grade dairy farming innovation at the individual farm level in Nzoia Settlement Scheme. The findings show that such lines of differentiation are reflected in the individual farmer's consideration of the option for what is the major farm enterprise. This was analysed on the basis of whether the farmers engaged in certain farm activities with a consciousness of the overall costs and receipts from the two major enterprises considered, that is, milk production and maize farming.
The conclusion here is that most farmers who had maize production did so without instituting the cost-benefit consideration, where profit maximisation should be the issue at hand. Most of the farmers in this category had also aversive emotions towards the dairy farming enterprise, as they considered it a relatively high risk venture, needing elaborate management and animal husbandry practices in which they were not trained. However, it was also realised that a majority of these farmers (see chapter four, part one) were not generally good farmers, compared to those who specialized in dairy farming as a major activity at farm level. They opted for maize production as a major enterprise because they were less adapted and had not fully integrated the dairy farming innovation which was introduced to the farmers on joining the scheme.

On the other hand, those farmers who did better dairy farming were generally average and above in their performance. In this case, this is, seen in terms of the overall outputs realised in the two major farm enterprises that were considered. This was the lot of farmers who had individual socio-economic attributes that were advantageous, and pertinently crucial at overall farm performance and the ability to sustain grade dairy farming innovation in the scheme. Their levels of income were relatively high, corresponding to the nature of performance at the individual farm levels. Apparently, such levels of income, from agricultural production, were found to be crucial and highly correlated with a farmer's
performance, at least in the quantity of milk produced and supplied to the market. In this light, such farmers were found to relatively have income levels that were sufficient to offset both subsistence, and to a large extent, other extra obligations faced by them.

One major realisation is however that there is no basis to conclude that such farmers were more placed to receive the extension service information. There was indeed almost no specifically dairy farming advisors in the scheme, apart from the junior veterinary officers who were mainly preoccupied with animal treatment. This is why it was shown that the present levels of farmers' performance was less related to the input from the extension service information (see chapter four). Rather, the farmers' productive capacities at the individual farm level, and with the incidence of the income levels, was more crucial, especially in sustaining and enhancing grade dairy innovation. In this case, though not explicitly measured in the study, our realisation was that farmers' performance tended to 'flock' with differential rates of modernisation, and hence the likely corresponding rates of innovativeness.

This realisation tends to justify our realisation that low levels of performance of farmers tended to be associated with the inability to sustain grade dairy farming. Since performance was related to the levels of agricultural produce incomes accruing to
individual farmers, and that grade dairy farming required increased current and fixed investments, the relatively poor farmers tended to take refuge to the traditional zebu or zebu-crossed cattle. This has been gradual, though, over the two decades since the farmers joined the scheme. Apparently this has been because of the increasingly declining income levels for such farmers, as they have had to fall to the less productive dairy cattle, producing lower quantities of milk. In this case, the units of production as employed by such farmers were seen to have been smaller; and that such are small because the farmers are poor (Mbilinyi, 1976:65). For instance, such farmers were found to exploit less of the available land resources such as tilling only a fraction of the total land acreage. They were less able to make investments in such grade dairy components as planting better quality pastures. Despite, therefore, having ample land resources, such were found to produce on more or less peasant production lines, with the major challenge being offsetting subsistence needs at the individual farm level.

The revelation of the study in this connection is that there will be more need for the extension service to focus more attention on the less enterprising farmers. We saw that the more stereotyped supposition that innovation usually diffuse from early adopters to the late and usually less affluent was not the case in the Nzoia Scheme. This is because we realised, more so in the case of an innovation such as grade diary farming, that some of the farmers
whose performance was quite below average lived in the neighbourhoods of very successful farmers. In this case adoption of such an innovation is curtailed because of the high financial investments required in the enterprise (Rogers and Shoemaker, 1971). This shows the need for re-examining the extension package in the region, in this case as relates to educating farmers, provision of credit, marketing services, roads, input provision and co-operative development.

The implication in this case is that a change in the whole approach of the extension service should be able to catapult such poor farmers into improved farming. They should be able then to undertake enterprises on the farm on the basis of input - output ratios and accordingly choose suitable farm enterprises. This may enable such farmers to be more self-sufficient, whose result should approximate the initial aims of setting up such settlement schemes by the Kenyan Government.

Though this study showed that family size had no significant association with the levels of investment in the quantity of milk produced and offered for sale, the explanation was because there was very little tangible investments made by farmers in this case. For instance, the general pattern of grazing in the scheme is extensive in nature, which as a result has less compulsion for the farmers to purchase additional feedstuffs such as hay, maclik and other concentrates as would be the case for zero-grazing. In
any case, there was no concrete evidence from the study that the incidence of financial drain by dependents would change, with a change in the absolute number of dependants, and lead to more investment in dairying enterprise.

In a nutshell, therefore, differentiation at the individual farm level occurs because of income disparities, which is dependent on other mitigating factors. For instance, the initial capital endowments at the disposal of the farmers when they joined the scheme appears to have been crucial. This may also be coupled with differential qualities of entrepreneurship and proper planning or not for the farm's future development goals. In addition differential degrees of risk aversion appears to have also been influential. There was also the perceived selective use of essential extension services due to differential accessibility, especially in the use or not of the artificial insemination services. This had been a major factor in the degenerative qualities of some farmers' animals, because such farmers resorted to use of poor quality bulls from neighbours. It thus affected the ability to sustain the introduced grade dairy farming innovation in the scheme. Lastly, though not least, the differential perception and energy expenditures as related to farm enterprise combinations and majors, and production levels decisions were crucial at the individual farm level.
In this case, there was observed wide variations in the technical and economic performance of farm families excelling under identical physical conditions of ecology, farm size (or in our case acrages put under farm enterprises), farming systems and access to water, farm inputs, credit extension and marketing services (Clayton, 1983: 37-41). There is the supposition that good farmers are relatively more innovative, and which when combined with such promotional activities as extension services and marketing facilities, have been sources of rural wealth, and must therefore contain the seeds of the present disparities (Roling, et al, 1973:16). Such differences arise because innovations are not adopted at the same time and pace (Rochin, 1972). And there is a complex and close link between innovation and resource mobilisation such that some innovations make (greater) demands on existing resources, such as (on) human time and settlement space (or increased cash investments in enterprises such as grade dairy farming development). These, then, are likely to lead to differentiation amongst individual farmers in a rural setting (Carlstein, 1974;1). They appear to be the basis for differential resource utilization as was seen in our case.

5.2: POLICY RECOMMENDATIONS

The situation as observed in the Nzoia scheme needs isolation of development problems more at the individual farm level. The change agents need to be more able to assess the local situation to be able to make options for what extension programme will be
more appropriate to the needs of the local clientele, and how to adopt research findings to the local conditions taking into account an area's natural resources, its marketing opportunities, land/labour relationships and the degree of sophistication of the farmers (Tiffen, 1974). An adoption of "the individual and group-approaches" simultaneously in educating the farmers will be quite worthwhile in the case of the Nzoia scheme more so in grade dairy farming. This should be able to offset the shortfall in the belief that innovations diffuse from the early adopters and trickle down to late adopters. In this case, this situation was not evident in the scheme. There will thus be need for the extension agents to organize group meetings (barazas) to educate farmers, but they have to follow up this to the individual farms to make sure the information is effectively utilized as recommended. This should also go along way in solving the individual socio-economic complications that affect rates of innovation adoptions among the farmers.

In the same light the change agents will need to establish conducive environment for rapport between the two parties involved, other than the more common style of "the extension staff coming with a package of supposedly superior practices, usually centrally advised, which they try to persuade the community to adopt" (Hunter, 1975:12).

A major problem regarding better grade dairy farming has been incessant cattle deaths due to the dreaded East Coast Fever disease
(E.C.F. disease). An improvement in the efficiency of the veterinary services, the availability of drugs at relatively subsidized rates, and the education of the farmers to understand the earliest disease symptoms, and thus respond faster, will be a milestone in itself. The artificial insemination services (A.I.) also need to be restructured and improved, in terms of availability, and an increase in the daily runs. Otherwise the more worthwhile undertaking will have to be the replacement of the A.I. service with bull camps in the scheme. This should alleviate problems of long distances reported by farmers to such centres, be able to reduce costs on fuel and other maintenance on the vehicles involved.

The government should however also endeavour to control the number and quality of bull-breeds for those farmers who must keep them individually. It should also be mandatory that for those farmers who, by some personal complications, can not sustain quality grade cattle, and want to keep cross-breeds, should do so under the guidance of dairy farming advisors. This then means there have to be a deployment of such agents to advice the farmers, as was realised that there were no specifically dairy farming advisors in the scheme then.

Such dairy farming advisors will also have to address themselves to various critical questions in this enterprise. They have to strive to educate farmers undertake the same on commercial basis and improve their income levels. There is the need to teach farmers
about effective farm management, and be able to prioritise certain farm enterprises on the basis of overall costs and benefits. This will involve further education about record keeping practices, which most farmers in the scheme were not doing. This probably is the only viable way for most of them being able to economically allocate and use their meagre resources at their disposal.

In animal husbandry management, there will also be the need for the extension agents to make farmers realise the need for more intensive grazing methods. This is because the impending population problem will in no long time be quite a constraint on the present nature of extensive grazing practised in the whole scheme. Farmers will need to do more of zero-grazing practices, and education on such other practices as silage and hay making will be another step forward in the development of the enterprise.

In the line of development capital, it will have to be imperative for the government to provide cheaper sources of capital to catapult the production capacities of those farmers who are below average. Such farmers should be given more incentives to acquire loans for development. In this case, the criteria for loan provision should not embed the notion of creditworthiness, viability of the investment and ability to provide security (Heyer, 1973:10). Rather, the criteria in meeting the demand (for loans) should be the repayment capacity (Belshaw, 1959:232). In addition there is need to improve the efficiency of
loan processing for farmers, to be ready in time for the planting season. For the case of the farmers in the Nzoia scheme region, it might be worthwhile to decentralise these services, say to establish a sub-branch at the divisional headquarters at Lugari, rather than Kakamega town many kilometres away. Such services could also be provided through the local co-operative society, but the usual problem of mismanagement of such institutions makes them less viable in dispersing such loans.

The provision of piped water in the scheme has been the other service so crucial to the improved grade dairy farming, but which has had maintenance problems for many years. The water supply is quite inadequate, and this trend needs to be changed. A more viable solution should be to tap water from the adjacent River Nzoia, other than the present source which is well over 20 Km away at Ziwa. This should alleviate the problem of incessant water shortages, and thus be a step further in recuperating the seemingly declining dairy farming in the scheme, for most farmers.

The other ancilliary services in the scheme pertinent to improved grade dairy farming were in the areas of communication and dipping facilities. These were found to be quite inadequate, and in some instances quite underdeveloped, especially as concerns access roads. Most of these roads are only operational during short spells of the dry seasons, otherwise are rendered almost impassable in most times due to gullies and mud. These need alot of improvement,
especially in gravelling and murraming, to make them more relatively passable throughout all the seasons. In this case, this will be able to improve on the total percentage of classified roads serving the settlement scheme region, which by 1984 was only ten percent of which the Nzoia scheme is only part (Kakamega District Development Plan 1984-88:22).

The nearest reliable postal services were well over seven kilometres away, at Moi's Bridge urban centre on the Kitale-Eldoret road. There is reason to establish a sub-post office at the nearby Nzoia market to be able to help farmers more adequately. This should also mean that most other farmers will see more need in subscribing for telephone services to their farms, which should put them more closer to the markets for their farm produce, especially in horticulture, fruit farming and poultry development.

There were only four plunge dips in the scheme region used communally by dairy farmers. These were inadequate, poorly managed and thus sometimes very ineffective in combating the problem of tick-borne diseases. There will be need to increase the number of such dips in the scheme, to reduce the long distances the farmers reported as having to make to dip their animals. There will also be the need to train more qualified dip attendants to manage dips more adequately. In addition, a solution need to be found for most of the non-scheme farmers in sisal estate who also dip their zebu cattle with scheme farmers. The local administration
and leaders need to provide separate dipping facilities, in this case.

5.3: AREAS FOR FURTHER RESEARCH

The experiences from this study shed light on a number of areas where further research would measurably contribute to alleviating problems of rural development. In the light of this study it was not possible to tackle all such issues because of the limited finances, need for more elaborate research designs and time factor.

Increased analysis in the area of resource allocation economics on the farm would be worthwhile in such planned rural settlement areas. In this case, analysis should be done of whether farmers adhere to the norm of cost-benefit consideration in their production and enterprise combinations. A research design which caters for the various expenditures on daily basis on inputs by the farmers, and extending to a period of a year and over would be adequate, in this case. At the end of such a period, records on the various enterprises outputs should be made, to enable a viable comparable analysis. In this case, this step would help determine the worth of farmers' engagement in certain agricultural enterprises. In the same light, such a step would help the extension service agents to advice the farmers accordingly.
It could also surface to try to find out, from such record keeping procedures, the major avenues of incomes derived from dairy farming. In this case, there will be the need to know whether such finances are rechannelled into more production of milk and general improved dairy farming development, especially for those farmers who produced lower quantities of milk.

In addition, an attempt at analysing such personal factors (at differential performance) likely to have an influence over a number of agro-economic and dispositional factors should be made. In this case, such attributes as fatalism, need achievement motivation, traditionalism, familism and overall modernity need to be measured and analysed. These should be able to explain more why there are perceived differences in performance at farming by individual farmers. Their effect, combined with the use or not of the extension service information, may just be the very explanations for more of these differentiation.

On the other hand there will also be a justification to establish why there was very low reported extension work in the scheme. This can be made possible through personal interviews with some of the extension agents, to find out why they consider it problematic, in their own analysis, in providing adequate and fruitfull services to the farmers. This is especially in the area of dairy farming development. Note should also be made of the farmers' likely considered options in farm enterprises, other than the "imposed" maize and grade dairy farming enterprises in the scheme when they
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INTRODUCTION: I am a student from University of Nairobi. I am carrying out a study on dairy farming development in this scheme. I would very much appreciate it if you would share your views on certain issues that I wish to explore and which are important for this study. Thank you.

1. Respondent’s name

2. Sex: Male: ........................................

   Female: ........................................

3. Age ........................................

   20----------24
   25----------29
   30----------34
   35----------39
   40----------44
   45----------49
   50----------54
   55----------59
   60 +--------

4. What is your ethnic group?

5. Marital status: Single ........................................

   Married: ........................................

   No of wives: ........................................

   Widowed: ........................................

   Divorced: ........................................

   Seperated: ........................................
6. What level of education did you complete?

1. None
2. Std. 1 - 4
3. Std. 5 - 8
4. Form 1 - 2
5. Form 3 - 4
6. Form 5 - 6
7. Over Form 6
8. Adult Education
9. Technical Training
10. University

7. What level of education did your wife/wives complete

8. How many children do you have in the family (family size)

9. How many of the children (in 8 above) are in:

1. Pre-primary
2. Primary school
3. Secondary School
4. Technical training
5. College/University
6. Other (specify)

10. Approximately how much fees do you pay for your children in school and/or in colleges (Kshs.)

11. How many of your children are:

   (a) Employed (specify)
(b) School leavers seeking employment

(c) Self-Employed (specify)

(d) Totally Unemployed

12. What do you do for a living?

(a) Farmer

(b) Teacher

(c) Housewife

(d) Unemployed

(e) Self-employed (specify)

(eg. Small trader in vegetable; casual labourer,

businessman such as shopkeeper, butcher,

middleman selling agricultural products etc).

(f) Other (specify)

13. Approximately how much income do you get from your occupation per month?

0 - 499
500 - 999
1000 - 1499
3000 - 3499
4000 - 4499
5000 and above

1500 - 1999
2000 - 2499
2500 - 2999
3500 - 3999
4500 - 4999
14. Do you get financial assistance from your working children?

Yes

No

If Yes, how much approximately per month from your:

Sons

Daughters

15. What other income sources do you have

- Shops

- Butchery

- Middleman selling agricultural produce

- Tailor

- Hotelier

16. How much other income do you receive from the other sources mentioned above per month? (KShs.)

17. When did you join the scheme? (Year)

18. (a) Did you know anything about dairy farming before you joined the scheme?

Yes

No

(b) If yes, explain (eg.

(i) worked for a muzungu previously

(ii) was involved in dairy farming in the previous home area

(iii) gained experience from a neighbour in the previous home area
(iv) attended dairy farming training before joining the scheme

(v) through attending agricultural shows; listening to radio programmes and reading dairy farming related newspapers

(vi) Other explanation

19. Were you producing any milk for sale before you joined the scheme?
   Yes
   No

20. (a) Have you taken any loans to develop the dairy farming on this farm?
    Yes
    No

   If Yes, when was this? (month/Year)

(b) (i) How much amount of loan was this?
    Kshs

   (ii) Or, was it in kind (eg. grass-seed; dairy animals; milk packets etc.)

21. Did you use the loan for the purpose intended or diverted to other uses (eg. urgent need to pay school fees; diverted to arable farming; used to do other businesses such as stocking a shop; used to marry another wife etc.)
22. To what extent has the loan helped you in your present dairy farming?
   (a) To a very small extent
   (b) To a small extent
   (c) To some extent
   (d) To a large extent
   (e) To a very large extent
   (f)

23. Did the loan lead to more milk production?
   Yes-------------------
   No-------------------

24. (a) Was the loan (a complete) failure
       Yes-------------------
       No-------------------
   (b) If yes, have you followed it up with a similar loan?
       Yes-------------------
       No-------------------
   (c) If No, explain why?-------------------

25. How did you repay the loan?
   (a) through milk sales-------------------
   (b) through incomes from other businesses such as shop, butchers, transportation etc.
   (c) through salary attachment
   (d) through the sale of other agricultural products
   (e) any other (specify)-------------------
26. What did you use the loan for?
   (a) purchasing high quality dairy livestock
   (b) buying animal feeds
   (c) development of pasture
   (d) building of a dairy house (parlour)
   (e) Any other use put to (specify)-------------------------

27. Have you gained from the loan in any other way other than dairy farming?
   (a) have been able to build a permanent house from milk sales proceeds;
   (b) have been more able to pay children's school fees etc.
   (c) managed to buy a matatu, tractor, grding mill (posho mill) etc.
   (d) Enabled me to pay the initial farm loan
   (e) Any other (specify)----------------------------------

28. Have you completed paying your initial farm loan?
   Yes-------------
   No-------------
   If no, how much is remaining? (Kshs)---------------------

29. How many dependants do you have on this farm (numbers)------

30. In which ways do you support the above dependants? eg:
   a) financial support.
   b) provided them with a piece of land for their own farming (quote acreage)-----------------------
   c) subsistence in food, milk etc----------------------
   d) Any other (specify)-----------------------------
31. How many workers do you have on this farm?
   a) In dairying---------------------
   b) Other farming activities (specify)------------------

32. (a) How much money in total do you pay these workers per month(Kshs.)------------------------
   (b) Do you provide them with any free milk -------------
       (quantity) or they buy?-----------------------------

33. Have you ever heard of other extension service? No-----------------------
    Yes--------
    (specify) eg veterinary officers; assistant agricultural officers;
    community development officers etc.

34. How many times did any of them (33 above) visit your farm (specify which)
   i) Last week---------------------------
   ii) Last month------------------------
   iii) Last 3 months---------------------
   iv) Last six months--------------------
   v) Last one year----------------------
   vi) Last five years--------------------

35. What did the extension service officials come to do?
   a) to treat a sick animal
   b) for a routine work visit
   c) to advice on dairy farming methods
d) to make a plot demonstration on the farm

e) Any other (specify)-----------------------------

36. If they have ever come specifically to advice you on dairy farming and management methods, explain the nature of the advice-----------------------------

37. Do you ever discuss with the extension service officials what you intend to do on your farm? (probe)-----------------------------

38. a) Have you suggested to them any project you wished to carry out on the farm?-----------------------------

b) Did they approve of your wish?

   Yes-----------------------------

   No-----------------------------

   (explain why not-----------------------------

39. How satisfactorily do you think the extension service carries out its work?

   a) very unsatisfactory

   b) Unsatisfactory

   c) Indifferent
d) Satisfactory
e) Very satisfactory.

40. What else have you to say about the extension service officials?
a) their numbers are inadequate
b) they are inefficient in their work
c) they are hard to reach when one has an urgent problem
d) they only serve some people they know personally
e) any other

41. How far is your original home from the scheme? (Kms).

42. a) Do you have another farm you personally own there?
   Yes--------- (acreage)
   No-----------

   b) What farming activities do you undertake there?
      i)----------------------------
      ii)----------------------------
      iii)---------------------------

   c) How frequently do you alternate between these two homes?
      ----------------------------------------

43. What can you say is the nature of your relationship with your neighbours?
   a) very good
   b) good
   c) friendly
   d) negative (antagonistic)
c) Very negative (antagonistic)

44. a) How many dairy animals were you given when you joined the scheme?

b) What breeds were they
   i) Guernsey
   ii) Friesian
   iii) Aryshire
   iv) Jersey
   v) Redpoll

45. a) What animals do you keep on your farm presently?
   i) Grade (dairy) animals
   no
   ii) Zebu
   "
   iii) goats
   no
   iv) sheep
   no
   v) donkeys
   no
   vi) others
   no

b) If Zebu cattle presently kept for what reason are they kept (eg, oxen for ploughing etc)

46. i) What can you say is the major activity you undertake on this farm (rank them)

<table>
<thead>
<tr>
<th>TIME SPENT/WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arable farming</td>
</tr>
<tr>
<td>Dairy farming</td>
</tr>
<tr>
<td>Horticulture</td>
</tr>
<tr>
<td>Poultry keeping</td>
</tr>
<tr>
<td>any other (specify)</td>
</tr>
</tbody>
</table>

ii) How much land acreage have you devoted to the major activity?

47. What is your reason for categorizing the activity mentioned as the major one on the farm? (eg. how do you compare incomes from other activities?)

Dairy farming (p.a)

Arable farming

Others (specify)

48. How far do you take your milk to the collection centre? (Km)

49. What is your mode of transportation?
   a) potterage (eg. carrying on one's head)
   b) by bicycle
   c) by tractor
   d) by pick-up
   e) donkey-cart
   f) lorry
   g) other (specify)

50. Approximately how much milk (Kgs) do you produce during:
   (i) the dry season
   (ii) the wet season

51. How much milk do you leave for home consumption in:
   (i) the dry season
   (ii) the wet season
52. Are there instances when you fail to produce milk completely (i.e., zero production whether in the dry or wet seasons?)
   (i) Yes-----------------------(Explain)---------------------------------------------

   (ii) No-----------------------

53. Do you ever use artificial insemination services for your dairy cattle (probe)--------------------------------------

54. (a) How easily available/accessible are the A.I. services (e.g., in terms of distance from the servicing centres)?-----(Km)

   No-----------------------

   (b) OR Do A.I. service officers ever come to your farm?  

      No-----------------------

      Yes-----------------------

55. How adequate are the services of A.I. officials?

   a) Very adequate
   b) adequate
   c) fairly adequate
   d) inadequate
   e) very inadequate.

56. Other than A.I. services, what other alternative do you have?--------------------------------------
57. Do you keep any farm records?
   i) No
   ii) Yes (Explain)

58. Which farm records pertaining to the following do you keep?
   a) dairy expenditure records
   b) dairy production records
   c) Arable production records
   d) general agricultural production records
   e) extension service visits records
   f) Others (specify)

59. What is the use of such records?

60. Have you ever invested in dairy farming at all (e.g., stock replacement; pasture development; dipping facilities development)? Yes No
61. If you invested in dairy farming, how far do you think this has rewarded your efforts (apart from higher milk production)?
   a) has enabled him/her build a permanent house
   b) enabled him/her start a shop, butchery etc business
   c) has been able to acquire other farm development loans from the guarantee of repayment through proceeds from high milk yields
   d) Any other (specify)

62. How much milk were you producing when you first joined the scheme? (Kgs)

63. How does that compare with the present milk production?
   a) Now much higher
   b) there has not been an increase or decrease
   c) there is no milk production presently

64. If you produce less (or no) milk presently what explanation can you give?
   1. 
   2. 
   3. 

65. How many milking animals have you had:
   1. in the past 6 months
   2. in the past 12 months
   3. in the past 5 years
   4. in the past 10 years
66. Have you ever replaced your old stock of dairy animals since you came to the scheme?
   i) Yes------------------ (explain what has been your method of replacement (e.g., natural replacement; purchasing other cattle etc)----------------
   ii) No-------------------

67. What major problems do you experience in dairy farming generally? (Let the respondent list and then rank them according to their strength) 1.------------------------
   2.
   3.
   4.
   5.

68. Who has been making the major decisions on this farm in the past ten years?
   a) Husband
   b) Wife
   c) Husband and wife
   d) elder son
   e) Any other (specify)----------------

69. To whom do the extension service talk on this farm?---------------------

70. Do you ever:
   i) attend agricultural barazas? YES----------------
                               NO----------------
ii) Read agricultural newspapers? YES

No

iii) Listen to agricultural radio programmes?

YES

No

(If yes, probe the respondent by asking him or her to mention the newspapers and radio programmes and times broadcast).

Newspapers read

Radio programmes | Name | Time
--- | --- | ---
1. | 1 | 1.
2. | 2 | 2.
3. | 3 | 3.

71. Have you ever had any dairy farming training?

eg. from a farmers' training Centre/College?

YES

NO

Period (years) | no of times
--- | ---
1. | 1.
2. | 2.
3. | 3.

72. Did you know that such programmes (71) exist for the benefit of farmers?

Yes

No
73. Have you ever been to an agricultural show?
   Yes--------------
   No--------------
   If yes, a) What month is it held, and town?-----------------
   ----
   b) When was this year?-----------------

74. Did you gain any dairy management knowledge from the show?
   Yes--------------
   No--------------

75. Looking at the number of your animals, how many milk (dairy) animals do you think should be kept per acre?-----------------(stocking rate)

76. Have the extension service officials ever told you about this stocking rate?
   Yes--------------
   No--------------

77. How do you compare with your present stocking rate?-----------------

78. How do you rate the condition of your animals?
   a) very highly degenerated
   b) highly degenerated
   c) fairly degenerated
   d) degenerated
   e) breed maintained
79. To what extent are you satisfied with the way you manage your dairy farming on this farm?

a) to a very great extent
b) to a great extent
c) to some extent
d) to a small extent
e) to a very small extent.

80. What is your view about the present milk price offered by KCC to dairy farmers?

a) it is fair/adequate
b) inadequate to cover production costs
c) just adequate to maintain production
d) very adequate
e) any other (explain)------------------------------

81. How much money is paid to you by KCC per pint of milk?

-------------------(Kshs.)

82. Do you send your milk through the local co-operative union or directly to KCC?

i) Through the Co-operative-----------------------------
ii) directly to the K.C.C. ------------------------

(Explain in each case)

83. How do you rate the local co-operative union management since you came to the scheme?

a) quite inefficient
b) inefficient
c) Fairly efficient
d) Efficient
e) quite efficient
f) not concerned with the way the co-operative is managed or run.

84. Would you produce (i) more milk if the price of milk was increased? Yes---------- No----------

(ii) more milk if its price was reduced?

Yes---------- No----------

(explain)------------------

85. Would you invest more in milk production if the price was i) increased? Yes---------- No----------

ii) decreased? Yes---------- No----------

Explain)-----------------

86. Are you satisfied with the present level of your milk production? Explain (in whichever case)--------------
87. Do you presently have piped water on your farm? Y

Yes-----------------

No-----------------

(Explain---------------------------------------------------------------)

88. If you have no water on your farm how far do you water your dairy animals? -------------(Kms).

89. Have you divided your farm into paddocks?

Yes------

No------

90. How much land have you spared for grazing on your farm (acreage)-----------------------------------------------

91. Is this grazing land adequate?

Yes-----------------

No-----------------(What other alternatives do you therefore employ?)

   a) grazing along the road

   b) grazing at the market place

   c) grazing on the neighbours farm

   d) Any other (specify)---------------------------------

92. How far do you dip your animals? no of Km----------------

   no of times per week----------------
93. What do you consider as having been the objectives or aims of creating settlement schemes?
   a) To resettle landless people (since the colonialists were leaving Kenya).
   b) To increase agricultural production
   c) To provide unemployed persons with the sources of income through their own farming.
   d) did not understand nor know the aims then.
   e) any other reason?

94. How do you compare the objectives with your own present performance?

95. How do you compare the objectives with the general performance of the farmers as a whole in the scheme?

96. Are there any solutions you would like to suggest from '94 and '95 if divergent?
   a)
   b)
   c)
   d)
97. What problems have you as an individual farmer faced in your dairy farming since you joined the scheme?

a) 

b) 

c) 

d) 

98. In your own view/opinion, what problems do you think the farmers as a whole face in this scheme in the field of dairy farming?

a) 

b) 

c) 

d) 

e) 

99. What solutions do you envisage for these problems as a whole?

a) 

b) 

c) 

d) 

e) 

f) 

100. Are there any particular plans you have for your future dairy farming on this farm?

a) 

b) 

Cc)