

**Factors Related to the Utilization of Artificial Insemination  
by Small-holder Dairy Farmers in Bomet District**

**A Thesis**

**By**

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For the Master of Science Degree in Agricultural Extension**

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## DECLARATION

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

Signed.....  ..... Date October 30, 1998.  
(Tuimising' Willie Ronoh)

This thesis has been submitted with my approval as the official University Supervisor

Signed.....  ..... Date 30<sup>th</sup> October, 1998  
(Prof. John Gowland Mwangi)

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## ABSTRACT

While dairy accounts for 10% of Kenya's GDP, it is constrained by breeding inefficiency which could be improved through better utilization of A.I.. The purpose of the study was to identify the factors related to A.I. utilization. The objectives included determining the relationship between the dependent variable (A.I. utilization) and the independent variables (the farmers' personal characteristics, their experiences with A.I. and the current A.I. service situation).

The questionnaire for data collection was designed by the researcher and certified content valid by peers and a panel of agricultural extension experts at Egerton University's Faculty of Education and Human Resources. A pretest using 30 respondents in the neighbouring Kericho District gave a *Cronbach alpha* reliability coefficient of 0.8023. The 210 respondents were selected from dairy co-operative societies using the stratified random sampling technique. The SPSS for Windows 95 was used for data analysis. *Alpha* was set *a priori* at 0.05.

Only 9.5% of the farmers used A.I., 68.1 % were over 40 years old and 84.3 % of the respondents were males. The farmers' level of education was low with 68.6 % of them having primary or no education and over 70 % having no vocational training. Some 82.3 % of the farmers had one or two income sources and the rest three or four. Prevalence of bulls was thought to hinder A.I. use by 77.6 % of the farmers. Other factors affecting A.I. use included diseases, non-availability of A.I., its cost and inadequate extension education coverage. Chi-square tests yielded statistically significant relationships between the dependent variable and the following independent variables: the farmers' experiences with A.I., their formal education as well as the number of income sources. Based on the results, the researcher concluded that the rate of A.I. use (9.5 %) was low given that A.I. had been in the district for long. Further, the farmers' formal education, income sources and

experiences with A.I. affected its use as did cost and non-availability. The researcher recommended that A.I. providers should make it more available while extension managers should ensure that farmers get current information regarding breeding to enhance their appreciation of A.I. principles. More attention should be focused on milk marketing, disease control and farmers' record keeping.

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## DEDICATION

This study is dedicated to our children **Jusper, Juliet, Jared** and **Jeff**; to my wife **Nancy**; parents; brothers and sisters. It is also dedicated to anyone who may legitimately derive benefit from it for posterity's sake.

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## ABBREVIATIONS

- A.I. - Artificial Insemination  
CAIS - Central Artificial Insemination Station  
CM - Conceptual Model  
CSS - Current A.I. Service Situation  
DCSs - Dairy Co-operative Societies  
DLPO - District Livestock Production Officer  
DVO - District Veterinary Officer  
FAO - Food and Agriculture Organisation  
FEs - Farmers' Experiences with A.I.  
FPCs - Farmers' Personal Characteristics  
FTC - Farmers' Training Centre  
GDP - Gross Domestic Product  
GOK - Government of Kenya  
KCC - Kenya Co-operative Creameries  
KGS - Kilograms  
KNAIS- Kenya National Artificial Insemination Station  
KSHS - Kenya Shillings  
MALDM - Ministry of Agriculture, Livestock Development and Marketing  
NGOs - Non-Governmental Organizations

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Within Kenya's agriculture, livestock is an important subsector. Dairy alone accounts for 10 % of the country's GDP and is a source of employment for many people (Anon, 1989; Stotz, 1980). This subsector provides employment, shelter, cash income and food rich in protein. As food, dairy products alleviate diverse forms of malnutrition thereby improving the health of the nation. Kenya's dairy industry is mainly made up of small-scale farmers who contribute about 80 percent of the country's total milk production (Baptist & Wakhungu, 1992). Some of the problems facing the dairy industry include diseases, lack of adequate feeds, breeding inefficiency and inadequate extension and marketing services. This notwithstanding, dairy remains the second most important economic activity in Bomet District (hereinafter referred to as Bomet) accounting for 20-35 % of household incomes (District Development Officer, 1994-96).

This study focused on Artificial Insemination (A.I.) as a breeding tool. In Bomet, preliminary reports indicated the existence of several factors affecting the utilization of A.I. technology (District Livestock Production Officer, 1996; District Veterinary Officer, 1996). Lack of quantified data regarding these factors made it hard to

adequately address the same with the aim of improving the utilization of A.I. then rated at about 1 % in the district (District Veterinary Officer, 1996). Nationally, A.I. use has been declining and is estimated to account for 20 % of the total inseminations (Baptist & Wakhungu, 1992). It was, therefore, imperative to study the selected factors so that their impact on A.I. use could be quantified. The results of the study should be useful to farmers and people in government, the private sector and non-governmental organizations (NGOs) who are interested in promoting the dairy industry in Kenya. Such people play significant roles in Kenya's agricultural development (Egerton University, 1995-98).

A.I. is not a new technology. A 14th century legend tells of an Arab chief using semen stolen from an enemy stallion. An Italian physiologist, Spallanzani, documented the first successful insemination of a bitch using fresh semen in 1780. In Kenya, A.I. was first introduced in 1935 by Dr. J. Anderson who published his work in the Empire Journal of Experimental Agriculture in 1939. The Central Artificial Insemination Station (CAIS) was established at Kabete in 1946 and A.I. schemes gradually set up in many parts of the country - Rongai , 1949; Molo, 1950; Sotik, 1956; Kinangop, 1957; and Nakuru, 1958.

The first Kenya National A.I. Service (KNAIS) was set up on July 1, 1966. A.I. fees then were K Shs 10.00 per series of four inseminations for a grade cow and K Shs 1.00 per zebu cow but went up to K Shs 5.00 for all cows by December 1, 1987. The prices kept rising to a maximum of K Shs 40.00 by October 1, 1990. These price fluctuations were prompted by changing operational costs and finally led to gradual privatisation of the service which began in 1992. Unauthenticated accounts blame the cost of A.I. for its underutilization. Part of the aims of this study was to identify the factors that could explain the prevailing scenario. Evans and Hopkins (1989) described A.I. as a superior technology for disseminating genes within a population at reasonable cost. It shortens calving intervals, improves dairy productivity, enhances estrus detection and timely service, effectively bridges generations and eliminates the cost of keeping bulls. It also improves herd fertility by minimizing breeding diseases. Through A.I., a bull can achieve up to 62,400 inseminations while incapacitated or physically incompatible sires can also be successfully used (Baptist & Wakhungu, 1992; Campos et al., 1994; Munyua & Mutasa, 1992).

## **1.2 Statement of the Problem**

A.I., albeit instrumental for high genetic gain, is not popularly used in Bomet despite its having been introduced in the area in 1956. Nationally, the situation is similar (Baptist & Wakhungu, 1992). Preliminary reports rated A.I. use in Bomet at about 1

% of the total inseminations. The factors at play needed to be studied systematically so that quantified data could be obtained to help in understanding the scenario. This study sought to provide that information.

### **1.3 Purpose and Objectives of the Study**

The primary purpose of the study was to identify factors which affect the use of A.I. among small-holder dairy farmers in Bomet. In addition, the study sought to establish the current rate of A.I. utilization and the extent to which the identified factors influence its use.

Specifically, the study sought to determine the

- a) current rate of A.I. utilization by small-holder dairy farmers in Bomet;
- b) influence of the farmers' personal characteristics on the utilization of A.I.;
- c) influence of the farmers' A.I. experiences on the utilization of A.I.;
- d) influence of the current A.I. service situation on the utilization of A.I. and
- e) way farmers ranked the obstacles to A.I. use.

The factors investigated included the farmers' age, gender, formal education, income and vocational training which were termed "Farmers' Personal Characteristics (FPCs)". Also studied were the farmers' knowledge of A.I., record keeping, heat detection ability, bull dominance, milk marketing, extension coverage and diseases under the category of "Farmers' Experiences With A.I. (FEs )" while accessibility

to A.I. service, cost of the service and efficiency of A.I. agents constituted the “Current A.I. Service Situation (CSS)”.

#### **1.4 Hypotheses of the Study**

The following null hypotheses were tested to meet the study objectives:

*Ho.1: There is no statistically significant relationship between the farmers’ personal characteristics and their utilization of A.I.*

*Ho.2: There is no statistically significant relationship between the farmers’ experiences with A.I. and their utilization of A.I.*

#### **1.5 Significance of the Study**

Through protracted calving intervals (450-900 days), Kenya loses an estimated 500 million kilograms (kgs) of milk annually. This is the antithesis of breeding efficiency whose remedy lies mainly on the use of A.I. (Anon, 1989). Bomet has about 194,530 grade animals from which about 20 million kgs of milk are marketed annually to Sotik KCC. An equivalent amount of milk is utilized domestically. However, the district annual milk yield potential is about 70 million kgs which remains untapped (District Livestock Production Officer, 1995). An improved level of A.I. usage would help in realising this potential.

Results from the study may be used to equip policy makers, extension managers, A.I. personnel and other relevant parties with useful information needed to unravel the problem of low A.I. use. Because Bomet is a typical dairying district in Kenya, the results may be useful to similar areas in the country. If the problems responsible for Kenya's estimated annual loss of about 500 million kgs of milk are tackled, the implied loss of about K Shs 7 billion would be checked. The study provided findings that might help in solving part of the problem.

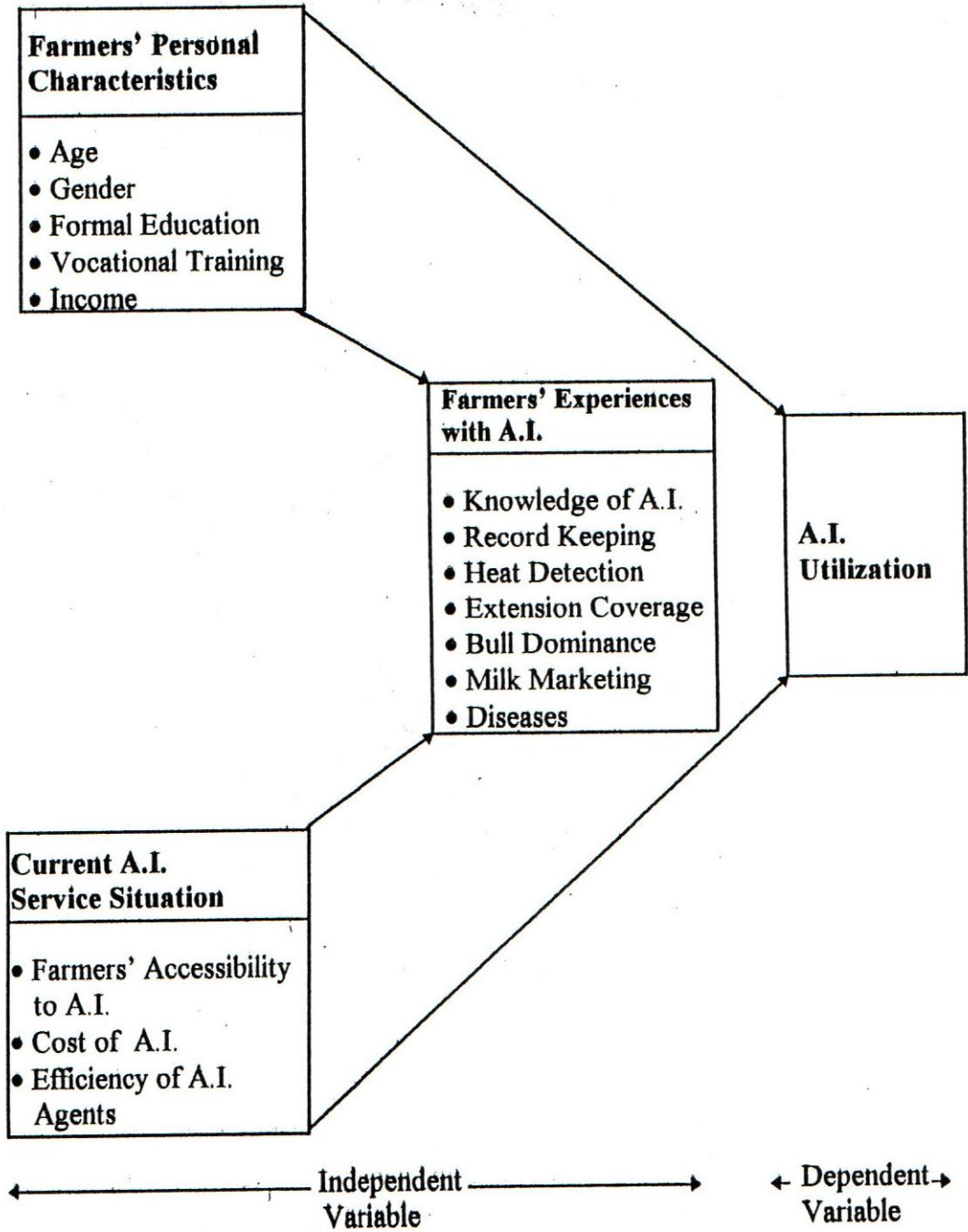
#### **1.6 Limitation and Basic Assumptions of the Study**

The study was limited to the factors identified by the researcher from pertinent literature as well as from personal experience with Kenya's Extension Service. It was assumed that each respondent was frank and that the information provided was a reflection of their true feelings. Further, it was assumed that the Dairy Co-operative Societies subdivided the target population into homogenous groups.

#### **1.7 A Conceptual Model for Identifying Factors Related to A.I. Use in Bomet**

The model (Figure 1) suggested that there were both direct and indirect influences on the dependent variable (A.I. utilization) by three sets of independent variables

(farmers' personal characteristics, experiences with A.I. and the current A.I. service situation).



*Figure 1. A Conceptual Model for Identifying Factors Related to A.I. Use in Bomet*

The direct influences suggested that

- a) the more conducive the farmers' personal characteristics, the better their utilization of A.I.
- b) the more experienced a farmer is with A.I., the better should be the utilization of A.I.
- c) the more conducive the current A.I. service situation, the better the utilization of A.I..

The indirect influences suggested that

- a) the more conducive the farmers' personal characteristics, the better their influence on the farmers' experiences with A.I. and so should be the influence on their utilization of A.I..
- b) the more conducive the current A.I. service situation, the better the farmers' experiences with A.I. and hence their utilization of A.I..

## 1.8 Definitions

The following are definitions of the research terms:

**Artificial Insemination:** This is the introduction of spermatozoa into the female reproductive tract by means other than natural mating (Lasley, 1987; Legates & Warwick, 1992).

**Breeding diseases:** These refer to either bacterial, viral, protozoal or fungal diseases associated with reproduction in cattle (Evans & Hopkins, 1989). Examples include trichomoniasis, campylobacteriosis and brucellosis. They significantly lower fertility in dairy herds and, subsequently, productivity.

**Current A.I. Service Situation:** This encompasses availability of A.I. services, farmers' accessibility to A.I. services, cost of A.I. and efficiency of A.I. service agents.

**Dam:** Breeding cow or heifer (Evans & Hopkins, 1989).

**Estrus:** This refers to the sexual receptivity of the dam. During estrus, the dam stands to be mounted by others (Evans & Hopkins, 1989; Schmidt & Vleck, 1982). It is the prime moment to effect insemination.

**Farmers' Experiences With A.I.:** These include knowledge of A.I., record keeping, ability to detect heat, extension coverage, dominant role and use of bulls as well as the cost-effective marketing of milk.

**Farmers' Personal Characteristics:** These include age, gender, formal education, vocational training and income.

**Genetic Improvement:** This refers to any gain in cattle performance attributed to manipulation of hereditary processes (Baptist & Wakhungu, 1992). Most important are improvements in productive and reproductive efficiency.

**Genotype:** The genetic make up of the animal (Lasley, 1987). Given the right environment, the genetic potential can be realized.

**Inseminator:** The person who artificially transfers semen to the dam. Essentially, this should be a trained technician (Schmidt & Vleck, 1982).

**Replacement Stock:** This refers to the fraction of the offspring raised to join or build the breeding stock and replace those culled (Lasley, 1987; Legates & Warwick, 1992). Ideally, they should be better than their parents.

**Sire:** The breeding bull (Evans & Hopkins, 1989). Ideally, such a bull should be superior to its contemporaries.

**Small-holder Farmers:** These are farmers with 7.5 hectares of land or less (Bomet District Development Officer, 1994-96).

**Spermatozoa:** Male gametes (Legates & Warwick, 1992). Though millions may be deposited in the female tract, most of the time it is only one which fertilizes the ovum.

## CHAPTER 2

### LITERATURE REVIEW

#### **2.1 Introduction**

This chapter discusses the superiority of A.I. and technology characteristics as they influence its utilization. Selected factors were examined in relation to A.I. technology utilization.

#### **2.2 A.I. as a Superior Technology**

Anderson and Potter (1984) established a positive correlation between the profitability of a dairy herd and its fertility as influenced by use of A.I.. Whereas A.I. use has been associated with economically efficient dairy enterprises, serious economic losses are attributed to reproductive inefficiency (Legates & Warwick,1990). Faulty estrus detection and untimely presentation for service contribute to protracted calving intervals. Baptist and Wakhungu (1992) established that by using A.I., an annual genetic progress of 2 % can be realised. This gain would be expected to elicit ambitious usage.

#### **2.3 Socioeconomic Considerations**

While current demographic trends which tend to diminish arable land are limiting the feed resource base required by improved genotypes, Baptist and Wakhungu

(1992) indicated that a genotype versus environmental interaction cannot be a real problem if the small-holder dairy farmers adopt appropriate animal husbandry practices. Because acceptance and effective use of a technology improves productivity, it affects the level and distribution of incomes. The people's perception of technology determines its adoption. Research has shown that farmers with high socioeconomic status easily adopt and utilize technology because they have the resources (Adams, 1984; World Bank, 1992).

#### **2.4 Technology Characteristics which Influence Its Use**

Hawkins and Van den Ban (1992) documented the main characteristics of a technology which determine its adoption and utilization. These include trialability, compatibility and relative advantage among others. Users of a technology may have varying perceptions of the same. Thus there is need to study and appreciate the farmers' perceptions and opinions as they impact on the formulation and administration of national agricultural policies and technologies. It would be instrumental to succinctly articulate the farmers' as well as national aspirations (Baptist & Wakhungu, 1992).

#### *2.4.1 Trialability*

Adams (1984) and Nappier (1991) observed that farmers would generally like to try a technology on a small scale prior to its wholesale adoption for purposes of demonstrating its efficiency. Farmers may wish, for example, to try A.I. on some cows in the herd and leave some for natural service. The higher the trialability, the better its rate of adoption (Fliegel, 1989). Poor timing of insemination would lead to repeat services whereas under natural mating, a sire would mostly serve once for conception to result if both sire and dam are healthy. In case of repeats, farmers would not think well of A.I..

#### *2.4.2 Compatibility*

Any technology meant for farmers' use must not conflict with their existing values, norms, past experiences, goals and aspirations as well as current farming conditions (Adams, 1984). The more compatible a technology is, the higher its utilization.

#### *2.4.3 Relative Advantage*

Any technology being promoted should demonstrate superiority over what it intends to replace (Hawkins & Van den Ban, 1992). This superiority may be in terms of economic or social gain. Nappier (1991) pointed out that small-scale farmers

emphasize short-term profits as well as social gains. Regarding A.I., profitability would only be easy to ascertain if every farmer kept records.

## **2.5 Diseases as a Constraint in Dairying**

In a study of small-holder dairying in Kiambu District, Gitau *et al.* (1996) found that Mastitis, Foot Rot, Theileriosis and Diarrhoeas adversely affected dairy productivity. More studies on the role of diseases on technology adoption and utilization needed to be carried out.

## **2.6 Selected Factors Which Influence Technology Utilization**

### *2.6.1 Farmers' Level of Education*

Education positively affects technology utilization ( Amudavi, 1993; Chitere, 1985). Amudavi's study showed that of the farmers who had adopted the use of high yielding varieties, 25 % were illiterate, 65 % had primary level education and 11 % secondary education. A World Bank (1992) evaluation of T & V demonstrated that high levels of education among Kenyan household heads accounted for earlier and higher adoption of all farming practices.

### 2.6.2 *Role of Extension Education*

A positive correlation has been established between farmers' links with information sources and adoption (Chitere, 1985; World Bank, 1992). That contact with information sources leads to higher adoption and utilization of technologies is supported by the work of Nweke (1983) who found that the adoption of new rice technology by farmers was very high where extension facilities and intensity were adequate. While the mission of extension is to help people help themselves (Gonzalez, 1982; Moris, 1991) many factors may affect the output of extension workers. The delivery of quality extension education programmes demands adequate amounts of appropriate information and technology as well as sound teaching approaches to effect the desired changes (Maatoug, 1981; Patton, 1987; Teh & Zainuddin, 1982). However, frontline extension workers encounter very difficult working conditions (Moris, 1981; Wiggins, 1988). This forces extension workers to reduce output to levels they can manage. Thus extension workers tend to visit fewer farmers than stipulated, organize fewer farmers' workshops and field days as well as demonstrations. Field reports are also usually months in arrears (Moris, 1991).

Inadequate resources impede the implementation of field activities. Little or no funds allocation, delayed or non-payment of travel and subsistence claims,

inadequate financing for field activities, lack of farm inputs, scarce promotions, lack of avenues for upward academic and professional mobility, inadequate supervision, non-recognition of talent and lack of rewards for extra efforts are some of the disincentives to adequate task performance (Moris, 1991). Paradoxically, extension staff appear to be working but in real terms farmers get very little of impacting education. With this type of scenario farmers are not kept abreast of changing technologies (Moris,1991).

### *2.6.3 Farmers' Age*

Voh (1982) depicted a negative correlation between age and technology utilization. Studies by Amudavi (1993) found no relationship between age and utilization. Another study by World Bank (1992) found that relatively young farmers were more likely to adopt new technologies.

### *2.6.4 Technology Availability*

Technology inavailability can severely constrain its adoption and utilization (Bahemuka & Mbithi, 1981; World Bank, 1992). Nweke (1983) found that, though costly, farmers popularly utilized tractor hire services simply because the government provided them on hire and made them available at the locational level for all farmers.

### *2.6.5 Cost of the Service*

A study by FAO (1992) indicated that cost is a major constraint to technology utilization. The World Bank (1992) confirmed FAO's findings which were consistent with Bahemuka's (1985) results that cost and other economic variables overwhelmingly determine adoption and utilization patterns.

### *2.6.6 Farmers' Gender*

A study by the World Bank (1992) found no statistically significant difference between male-headed and female-headed households regarding technology use. The results were not supported by Oywaya (1995) who found out that female-headed households posted higher technology use rates compared to the male-headed ones.

## **2.7 Unsuccessful Technology Transfer**

Moris (1991) has documented three cases of unsuccessful transfer of technology. The first concerned swamp rice cultivation in Sierra Leone using improved Asian varieties. The technology failed because it was extremely labour intensive; the varieties less palatable and harder to sell; sickness greater; and it obligated farmers to monotonous rice monocropping. Second was the water harvesting technology in Kenya's Turkana areas using constructed earth diversion bunds meant to concentrate

run-off water sufficiently to facilitate crop production. Drought victims (mostly women) were required to construct these massive earth works in exchange for food. However, the project failed because the unconsolidated structures (irrelevant to Turkana women farmers) were predisposed to intense tropical rainstorms leading to their catastrophic failure. Thirdly, scientists in Malawi attempted to improve small-holder maize production by introducing soft, dent maize varieties in place of the indigenous flint varieties. The false assumptions were that the dent varieties were more nutritious and easier to grind manually whereas farmers preferred the flint varieties because they dried on the cob without spoilage, were more resistant to weevils, and could be replanted without fertilizer.

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.1 Research Design

The study employed an *ex post facto* design. The effects of the three sets of independent variables (FPCs, FEs and CSS) on the dependent variable (A.I. utilization) were studied as they had occurred naturally. By collecting data at one point in time with the subjects having self-selected levels of the independent variables, the threat of “history” was checked. A number of independent variables were built into the study so that their effects on the dependent variable could be established ( Borg & Gall, 1983 ). These variables included the farmers’ age, gender, formal education, income, vocational training, the role and dominance of bulls, diseases, extension education coverage, knowledge of A.I., record keeping, heat detection ability, milk marketing, accessibility to A.I. services, cost and efficiency of A.I. agents.

#### 3.2 Target Area, Population and Sampling

##### 3.2.1 Target Area

Bomet was selected for this research because A.I. has been used in the area for about forty (40) years and the researcher knew the area well.

Bomet is one of the 16 districts in Rift Valley Province. It has the following features:

Topography:	Mainly undulating but flattens southwards
Geographical position:	0°29' - 1°03' South; 35°05' - 35°35' East.
Altitude	1,600 - 2,300m above mean sea level
Rainfall:	1,000-1,400 mm per annum (bimodal)
Temperatures:	16°-24°C
Land area:	1,834.5 km <sup>2</sup>
Arable land:	1,500 km <sup>2</sup>
Soils:	Loam and clay
Divisions:	Sotik, Konoin, Kimulot, Sigor, Longisa, Bomet Central, Siongiroi and Chepalungu.
Human population:	449,521 (1996 projection)
Agroecology:	Lower Highland (LH) Upper Midland (UM)

### 3.2.2 *Population and Sampling*

The target population comprised all the small-scale dairy farmers registered under Dairy Co-operative Societies (DCSs) in Bomet. There were about 40 such co-

operatives in the district each with an average of 100 members. Each of these farmers had 7.5 hectares of land or less and an average of five adult cows either on natural or improved pastures. Three of Bomet's eight divisions were selected based on the predominance of dairying, presence of active DCSs and more than one A.I. agency. The divisions had varying numbers of DCSs and the number of members varied within each DCS. To arrive at an acceptable sample that correctly represented the farmers in each DCS as a percentage of the total population, proportional random sampling was done. Randomization ensured that every member had an equal chance of being selected. A total of 210 farmers were selected to participate in the study. This sample size was considered adequate for purposes of survey research.

### **3.3 Instrumentation**

The questionnaire for this study was developed based on the objectives. It was reviewed and found to be content valid by peers and agricultural extension experts at Egerton University's Faculty of Education and Human Resources. All useful comments were used to improve the instrument prior to pretesting using 30 farmers in Belgut Division of Kericho District which has conditions similar to those in Bomet. Results from the pretest indicated a reliability coefficient of 0.8023 which

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was above the 0.70 threshold for acceptable reliability (Mwangi, 1993). The alpha confidence level was set *a priori* at 0.05.

### **3.4 Data Collection**

Two enumerators were selected to assist the researcher. Their selection was based on the following criteria:

- (a) Whether they were technical officers in livestock production.
- (b) Language proficiency (English and Kipsigis).
- (c) Good public relations.

Those selected were thoroughly trained to ensure proficiency in data collection. The training covered such areas as public relations, correct interpretation of questions, the use of probing questions to ascertain the answers given and convenient timing for administering the questionnaires. Simulation of real work was done before actual administration of the questionnaires which was done in person by both the researcher and the enumerators. The entire data collection process took place smoothly between June and September 1997. Table 1 below shows how the DCSs were selected for the study.

Table 1

Selection of DCSs for the Study

Division Selected	No. of DCSs Present
Sotik	8
Bomet Central	4
Konoin	3
Total	15

To arrive at the exact number of farmers to be selected from each DCS, the total number of members on each society's list was divided by the total number of members in all the 15 DCSs and the result multiplied by the required sample size (210). Ultimately, the respondents to participate in the study were systematically picked from each list.

### 3.5 Data Analyses

The Statistical Package for Social Sciences (SPSS) for Windows was used for data analyses. Descriptive statistics were used to determine the measures of central tendency and dispersion. They described both the dependent and independent variables and were also used to meet objective five. Inferential statistics were used

to determine the relationships between the independent and the dependent variables. Specifically, Cross-tabulation analysis was run to determine the relationships between the discrete variables and the utilization of A.I. as required by the Chi-Square statistic (Glass & Hopkins, 1984). Table 2 shows a summary of the tests for the hypotheses used.

*Table 2*

*Summary of Statistical Tests for the Hypotheses Used*

<b>Hypothesis</b>	<b>Independent Variable</b>	<b>Dependent Variable</b>	<b>Statistical Test</b>
<b>Ho.1:</b> There is no statistically significant relationship between the farmers' personal characteristics and A.I. utilization	Age, Gender, Formal Education, Number of Income Sources and Vocational Training	A.I. Utilization	Chi-square
<b>Ho.2:</b> There is no statistically significant relationship between the farmers' experiences with A.I. and its utilization.	Bull Dominance, Diseases, Extension Coverage, Heat Detection, Farmers' Knowledge, Milk Marketing, and Record Keeping	A.I. Utilization	Chi- square

## CHAPTER 4

### RESULTS AND DISCUSSIONS

This chapter presents the results of the study in relation to each research objective or hypothesis. The results are followed by short discussions of their implications on A.I. utilization by farmers in Bomet.

#### 4.1 Frequency Distributions

##### 4.1.1 Objective One

The first objective sought to determine the current rate of A.I. utilization by small-holder dairy farmers in Bomet. The variable was operationalized by a question as to whether farmers used A.I. or not. Table 3 presents the frequency distribution of responses regarding this variable.

Table 3

*Current Users of A.I. (N = 210)*

Category	Frequency	Percent
User	20	9.5
Non User	190	90.5
Total	210	100.0

Only 9.5 % of the farmers were using A.I.. By implication, this is a very low rate. Though higher than the 1% shown in preliminary reports (District Veterinary Officer, 1996), it is lower than the 20% national average. By extension, a meagre 9.5 % of dairy farmers in Bomet enjoy the advantages associated with A.I.. This finding supports an earlier finding by Baptist and Wakhungu (1992) in which the use of A.I. was found to be low.

#### **4.1.2 Objective Two**

The second objective sought to determine the farmers' personal characteristics (FPCs) which were thought to influence A.I. utilization. These included the farmers' age, gender, formal education, income and vocational training. The implications of each variable on A.I. utilization are discussed below.

##### *4.1.2.1 Farmers' Age*

Table 4 shows that over two thirds of the farmers were relatively old (41-80 years) while the rest fell in the cohort 21 - 40 years. The implication of having a large proportion (68.1 %) of relatively old farmers in dairy farming may be that the strength and enthusiasm to utilize A.I. would be limiting. Relatively young farmers have been found to be more likely to adopt and utilize technologies.

Table 4

*Farmers' Age Distribution (N=210)*

<u>Age in Years</u>	<u>Number</u>	<u>Percent</u>
21-40	67	31.9
41-60	104	49.5
61-80	39	18.6
<u>Total</u>	<u>210</u>	<u>100.0</u>

4.1.2.2 *Farmers' Gender*

The gender analysis presented in Table 5 shows that a higher proportion (84.3 %) of the farmers were males. Given the characteristic male dominance over resources and decision making, one would expect that male farmers would be better adopters of A.I.. However, for unclear reasons, this was not the case.

Table 5.

*Farmers' Gender Analysis (N=210)*

<u>Gender</u>	<u>Frequency</u>	<u>Percent</u>
Males	177	84.3
<u>Females</u>	<u>33</u>	<u>15.7</u>
<u>Totals</u>	<u>210</u>	<u>100.0</u>

#### 4.1.2.3 Farmers' Formal Education

As seen from Table 6, the majority of the farmers interviewed (68.6 %) had either primary level education or none at all. A very likely implication of such a distribution would be low utilization of A.I. because this technology requires an understanding and appreciation of basic principles. One needs some education to easily understand these principles (Amudavi, 1993).

Table 6.

#### Farmers' Level of Formal Education (N=210)

Level	Number	Percent
None	46	21.9
Primary	98	46.7
Secondary	53	25.2
Post Secondary	13	6.2
Total	210	100.0

#### 4.1.2.4 Farmers' Income Sources

The frequency distribution of Bomet farmers' significant sources of income (see Table 7) shows that only 17.7 % of the farmers had three to four different sources of income with only 1 % having four sources. The rest (82.3 %) had either one or two

sources. This is indicative of a relatively low income community not likely to afford the cost of A.I. (K Shs 200-250 per insemination for private A.I.). Where government A.I. service existed, the cost of fueling government vehicles by farmers to transport inseminators was found to discourage them. Apart from formal employment cited by 18.1 % of the farmers, the other income sources cited, namely: dairying (95.2 %); business such as operating a canteen (15.2 %); and crop farming (1.9 %) were found not to be viably operated. No records of transactions were kept. Neither were the enterprises consistently operated. Given the relatively low income levels, it is expected that the high cost of A.I. would constrain its use by the average farmer. That cost can constrain technology utilization has also been reported by FAO (1992) and World Bank (1992).

Table 7

*Farmers' Income Sources (N=210)*

No. of Income Sources	Number of Farmers	Percent
1	38	18.1
2	135	64.2
3	35	16.7
4	2	1.0
Total	210	100.0

#### 4.1.2.5 Farmers' Vocational Training

According to Table 8, most farmers (71 %) had no vocational training which could make up for their deficiencies pursuant to formal education by sensitizing them to appreciate and adopt superior technologies such as A.I. The 29 % who had vocational training had actually attended Farmers' Training Centres (FTC) or other courses which were not necessarily for A.I. education. Consequently, the majority of Bomet's dairy farmers could not be expected to be conversant with A.I..

Table 8

#### Farmers' Vocational Training (N=210)

<u>Vocational Training</u>	<u>Numbers of Farmers</u>	<u>Percent</u>
Attended	61	29
Never Attended	149	71
<u>Total</u>	<u>210</u>	<u>100</u>

#### 4.1.3 Objective Three

The third objective sought to determine the farmers' experiences that tended to influence A.I. utilization. These included the dominance of bulls in breeding, the presence of livestock diseases, extension education coverage, ability to detect cows

on heat, farmers knowledge of A.I., milk marketing, and record keeping. The following are the frequency distributions and implications of each variable.

*4.1.3.1 Dominance of Bulls*

Table 9 shows that the majority of farmers (77.6 %) believed that natural service was more efficient than A.I.. Recalling that 68.1 % of the farmers were either middle aged or very old, it seems reasonable to infer that this belief in bulls by most farmers negatively impacts on A.I. utilization. Individuals psyched to distrust A.I. may not be willing to try it even if the service was brought closer to them. A complicating factor in this case is the issue of repeat services rampant among cows served using A.I.. Though not etiological for the said repeats, A.I. would be blamed wholesale. The role and dominance of bulls explain, to a certain extent, the low use of A.I. among small-holder dairy farmers in Bomet.

Table 9.

*Dominance of Bulls (N=210)*

<u>Farmers' Preference</u>	<u>Number of Farmers</u>	<u>Percent</u>
Bulls	163	77.6
A.I.	47	22.4
Total	210	100.0

#### 4.1.3.2 Disease Occurrence

As shown in Table 10, East Coast Fever (ECF), Helminthiases, Anaplasmosis and Mastitis were the most common livestock diseases during the year. Most improved dairy cattle are highly susceptible to ECF and Anaplasmosis both of which are killer diseases. The cost of treating them is not affordable to many farmers. It is therefore expected that most farmers with low financial ability would shun A.I. and opt for local genotypes known for innate resistance to most diseases. Good tick control would effectively control these diseases but most cattle dips in Bomet ceased to function when the government surrendered dip management to farmers as required under the liberalization policy. This policy was meant to enhance the efficiency of tick control by handing over the management of cattle dips to farmers themselves. However, for some reasons, this change of management led to the collapse of most cattle dips in Bomet. Though undocumented, factors such as poor management and inadequate funds could be implicated. The scenario would probably be different if farmers were assisted to acquire better management skills.

The other diseases, albeit not fatal, constitute production constraints which make dairying uneconomical. Apart from lowering milk yields, some of these diseases cause abortions which not only prolong calving intervals but also lead to loss of potential calf crops. All these effects put together could lead to low utilization of A.I.. Similar effects have been reported by Gitau *et al.* (1996) who found that

mastitis, Foot Rot, ECF and Diarrhoeas had a negative impact on dairying in Kenya's Kiambu District.

Table 10

*Incidence of Diseases in The Herd (N=210)*

Farmers Reporting it in the Herd (June 1996-June 1997)		
<u>Disease</u>	<u>No.</u>	<u>%</u>
ECF	188	89.5
Diarrhoeas	158	75.2
Helminthiases (worms)	157	74.8
Anaplasmosis	135	64.3
Mastitis	134	63.8
Abortions	66	31.4
FMD	42	20.0
Milk Fever	30	14.4
Bloat	27	12.9
Foot Rot	25	11.9
Dystocia	21	10.0
Red Water	9	4.3
Heart Water	7	3.3
<u>Anthrax</u>	<u>3</u>	<u>1.4</u>

#### 4.1.3.3 Extension Education Coverage

Table 11 shows that the proportion of farmers (53.8 %) reporting that they knew the extension workers in their area was almost equal to those who did not (46.2 %). Regarding when they were last visited by extensionists, 34.5 % of the farmers indicated that they had never been visited while 31.1 % could not recall the last time they were visited. The rest of the farmers (34.4 %) reported intermittent visits from extensionists. The implication is that farmers are left without the active stewardship inherent in extension. Thus technological benefits requiring active articulation by extension workers remain unknown to most farmers. Hence, almost two thirds of dairy farmers in Bomet are not routinely assisted by extensionists in making crucial farming decisions. For A.I., this may have led to low utilization.

Table 11

#### Extension Education Coverage (N = 210)

Coverage	Number of Farmers	Percent
Covered Well	113	53.8
Not Well Covered	97	46.2
Total	210	100.0

#### 4.1.3.4 Heat Detection Ability

As seen in table 12, most farmers (71.4%) reported that they could always detect cows on heat while 27.6 % could do so most of the time. This implies that estrus detection was not limiting to 99% of the farmers as far as A.I. utilization was concerned. Although accurate estrus detection is essential for A.I., the good heat detection ability in this study did not explain its low utilization.

Table 12.

#### *Farmers' Ability to Detect Cows on Heat (N=210)*

Ability	Number of Farmers	Percent
Always Able	150	71.4
Able Most of the Time	58	27.6
Mostly Unable	2	1.0
Total	210	100.0

#### 4.1.3.5 Farmer's Knowledge of A.I.

This variable was operationalized using several questions whose responses were weighted on a Likert-type scale with 5 representing the maximum score and 1 the least. A mean knowledge score of 3.98 was found. This apparently high score can be explained by the fact that A.I. has been present in Bomet for over 40 years. Because knowledge of technologies is known to play significant roles in their adoption and

utilization (Mbugua, 1996), the Bomet farmers would be expected to have a much higher rate of utilization than was found. This means that their high level of knowledge notwithstanding, other factors militate against the higher utilization rate expected.

#### *4.1.3.6 Farmers' Milk Marketing*

Table 13 shows the farmers' satisfaction with milk marketing. Sotik KCC was the major outlet of milk for 71.9 % of the farmers. Of the remaining farmers, 14.3 % sold their milk locally and 11 % to Kabianga Creameries which is relatively new in the area. Some 2.8 % of the farmers either had no milk to sell or sold theirs erratically. Regarding satisfaction with milk marketing, only 26.2 % were very satisfied whereas 73.4 % reported varying degrees of dissatisfaction mainly attributed to low prices and delayed payments. The implication of such a high proportion of farmers expressing poor satisfaction with milk marketing was that fewer farmers would probably be enthusiastic to use A.I. which is supposed to increase milk yields. Poor prices and delayed payments are disincentives to the utilization of superior technologies like A.I..

Table 13

*Farmers' Satisfaction with Milk Marketing (N=210)*

<u>Attribute</u>	<u>Number</u>	<u>Percent</u>
Very Satisfied	55	26.2
Satisfied	39	18.6
Disatisfied	91	43.3
<u>Very Disatisfied</u>	<u>25</u>	<u>11.9</u>
<u>Total</u>	<u>210</u>	<u>100.0</u>

*4.1.3.7 Record Keeping*

As seen in Table 14, the majority of farmers (72.4 %) did not keep records. The implication of very few farmers keeping records is that the benefits associated with record keeping (such as predicting estrus) are not being realized by the majority. This meant the majority of the farmers ran their dairy enterprises haphazardly. Even the 27.6 % who kept records did not do so consistently. Overall, this meant that record keeping, a requirement in modern management, was still wanting amongst most dairy farmers in Bomet. It was not easy for such farmers to tell when their cows were served and, therefore, when they were expected to calve down. They could not even tell which of their cows were repeat breeders. Furthermore, they could not compute accurately the calving intervals for each cow. Yet prolonged

calving intervals account for serious economic losses in dairying (Baptist & Wakhungu, 1992).

Table 14

*Farmers' Record Keeping (N=210)*

<u>Attribute</u>	<u>Number</u>	<u>Percent</u>
Keep	58	27.6
Do Not Keep	152	72.4
Totals	210	100.0

#### **4.1.4 Objective Four**

The fourth objective sought to determine the current A.I. situation in relation to its utilization. The variables studied were the farmers' accessibility to A.I., their perception of the cost of A.I., and the efficiency of A.I. agents. The following were the frequency distributions and implications of each.

Table 15

*Farmers' Accessibility to A.I. Services (N = 20)*

<u>Accessibility to A.I.</u>	<u>Number of Farmers</u>	<u>Percent</u>
Very Difficult	6	30
Difficult	6	30
Moderately Difficult	6	30
Easy	1	5
Very Easy	1	5
<u>Total</u>	<u>20</u>	<u>100</u>

As shown in Table 15, A.I. was not readily accessible to 90 % of the farmers. While farmers may be keen to use A.I., inaccessibility may become a constraint (Bahemuka & Mbithi, 1981).

As seen from Table 16 below, cost was perceived to be limiting by 70 % of the farmers implying that only a few farmers could afford to routinely use A.I. while, overall, the service remained underutilized. Cost as a constraint has also been reported by FAO (1992) and World Bank (1992).

Table 16

*Farmers' Perception of A.I. Cost (N=20)*

<u>Perception of A.I. Cost</u>	<u>Number of Farmers</u>	<u>Percent</u>
Too High	4	20
High	10	50
Moderate	5	25
Low	0	0
Very Low	1	5
<u>Total</u>	<u>20</u>	<u>100</u>

Over half of the A.I. agents (55%) were perceived to be efficient while 45 % were perceived to be inefficient (see Table 17). Farmers were asked to rate efficiency using such parameters as punctuality and the incidence of repeats. The implication of this situation was that inefficiency of A.I. agents may have constrained A.I. utilization.

Table 17

*Farmers' Perception of Efficiency of A.I. Agents (N=20)*

<u>Attribute</u>	<u>Number of Farmers</u>	<u>Percent</u>
Very Efficient	4	20
Efficient	7	35
Inefficient	7	35
<u>Very Inefficient</u>	<u>2</u>	<u>10</u>
<u>Total</u>	<u>20</u>	<u>100</u>

**4.1.5 Objective Five**

The fifth objective sought to determine the farmers' perception of obstacles hindering their effective use of A.I. services, hence their low adoption and utilization of the practice. The variable was operationalized by a question asking the farmers to identify the obstacles in order of their decreasing importance. As seen from Table 18 , Bomet farmers perceived non-availability of A.I. services as the number 1 obstacle to effective use of A.I. services followed by limited knowledge of A.I., high cost of A.I. services, bull dominance in breeding, and livestock diseases. By implication, the totality of these obstacles was bound to impinge on A.I.utilization.

Table 18

*Farmers' Ranking of Obstacles to Effective Use of A.I. (N = 210)*

<u>Response</u>	<u>Percent Frequency</u>	<u>Ranking</u>
Non-availability	91.4	1
Limited Knowledge	34.3	2
High Cost	23.8	3
Bull Dominance	14.3	4
Diseases	8.1	5

**Note:** The percentage frequencies show the ranking by individual response

## 4.2 Hypotheses Testing

### 4.2.1 Hypothesis One

The first hypothesis stated that *there was no statistically significant relationship between the farmers' personal characteristics and their utilization of A.I.* The farmers' personal characteristics included age, gender, formal education, income sources and vocational training. All data were collected and recorded in discrete form. The results of Cross tabulation tests, using the Chi-square statistic, are presented below.

#### 4.2.1.1 Farmers' Age

As presented in Table 19, a Chi-square value of 2.154 at 2 degrees of freedom was obtained between farmers' age and A.I. utilization, which was less than the critical value of 3.71 at  $p < 0.05$ .

Table 19

#### A.I. Utilization By Farmers' Age (N=210)

A.I. Utilization	Age (years)			Total
	21-40	41-60	61-80	
User	9	9	2	20
Non User	58	95	37	190
Total	67	104	39	210

$\chi^2_{\text{calc.}} = 2.154$        $df = 2$        $\chi^2_{\text{crit.}} = 3.71$        $p < 0.05$

Consequently, the null hypothesis was accepted indicating that *there was no statistically significant relationship between the farmers' age and A.I. utilization.*

This finding was consistent with Amudavi's (1993) and World Bank's (1992).

#### 4.2.1.2 Farmers' Gender

The Chi-square test for farmers' gender and A.I. utilization are presented in Table 20. The Chi-square value obtained was 0.009 which was less than the critical value (3.14) at one degree of freedom and  $p < 0.05$ . Hence the null hypothesis stating that *there was no statistically significant relationship between A.I. utilization and farmers' gender* was accepted. That gender was not significantly related to technology utilization concurs with World Bank's (1992) finding but contradicts Oywaya's (1995).

Table 20

#### A.I. Utilization By Farmers' Gender (N=210)

<u>A.I. Utilization</u>	<u>Gender</u>		<u>Total</u>
	<u>Male</u>	<u>Female</u>	
User	17	3	20
Non User	160	30	190
<u>Total</u>	<u>177</u>	<u>33</u>	<u>210</u>

$\chi^2$  calc. = 0.009      df = 1       $\chi^2$  crit. = 3.14      p < 0.05

#### 4.1.2.3 Farmers' Formal Education

Since the Chi-square value calculated (2.008) was greater than the critical value (1.24) at three degrees of freedom and an alpha of 0.05, the null hypothesis was rejected and the alternative accepted indicating that *there was a statistically significant relationship between farmers' formal education and A.I. utilization*. This finding is in tandem with those by Amudavi (1993), Chitere (1985) and World Bank (1992) in which education was found to invariably enhance technology utilization. Better educated farmers would, in general, be expected to utilize A.I. more than the less educated ones.

Table 21

#### A.I. Utilization By Farmers' Formal Education (N=210)

A.I. Utilization	Education				Total
	None	Primary	Secondary	Post-secondary	
User	2	11	6	1	20
Non User	44	87	47	12	190
<b>Total</b>	<b>46</b>	<b>98</b>	<b>53</b>	<b>13</b>	<b>210</b>
$\chi^2$ calc. = 2.008	df = 3	$\chi^2$ crit. = 1.24		p < 0.05	

4.2.1.4 *Farmers' Vocational Training*

Table 22 presents the Chi-square test for farmers' vocational training and A.I. utilization. The value calculated (2.729) was less than the critical (5.81) at  $p < 0.05$  and one degree of freedom. Hence the null hypothesis was accepted indicating that *there was no statistically significant relationship between vocational training and A.I. utilization.*

Table 22

*A.I. Utilization By Vocational Training (N=210)*

A.I. Utilization	Attended Training		Total
	Yes	No	
Users	53	100	153
Non Users	08	49	57
Total	61	149	210

$\chi^2_{\text{calc.}} = 2.729$        $df = 1$        $\chi^2_{\text{crit.}} = 5.81$        $p < 0.05$

Recalling that most of the farmers (71 %) had no vocational training (see Table 8), it seemed reasonable to infer that although the results above implied no association, the scenario might have been different given a higher number of farmers with the training. Thus vocational training that incorporates A.I. would be expected to facilitate the adoption and utilization of A.I.

#### 4.2.1.5 Farmers' Sources of Income

Table 23 shows that the Chi-square value obtained (0.957) was greater than the critical value (0.19) at  $p < 0.05$  and three degrees of freedom. Thus the null hypothesis was rejected and the alternative accepted indicating that *there was a statistically significant relationship between the farmers' income sources and A.I. utilization*. This implied that the more the farmers' income sources, the more likely the farmers were to adopt and utilize technologies. This tallied with reports by Adams (1984) and World Bank (1992).

Table 23

#### A.I. Utilization By Income Sources (N=210)

A.I. Utilization	Income Sources				Total
	1	2	3	4	
Users	4	14	2	0	20
Non Users	34	121	33	2	190
Total	38	135	35	2	210

$\chi^2$  calc. = 0.957      df = 3       $\chi^2$  crit. = 0.19       $p < 0.05$

#### 4.2.2 Hypothesis Two

The second hypothesis stated that *there was no statistically significant relationship between the farmers' experiences with A.I. and its utilization*. The farmers' experiences with A.I. were operationalized using the following variables: bull

dominance, record keeping, extension education coverage, knowledge of A.I., heat detection ability, diseases, and milk marketing. All the data pursuant to the above were collected and recorded discretely. Subsequently, cross tabulation tests using the Chi-square statistic were run to establish the relationships. The following were the results:

#### 4.2.2.1 *Bull Dominance*

As shown in Table 24, the Chi-square value obtained (67.297) was higher than the critical value (0.86) at  $p < 0.05$  and four degrees of freedom. Hence the null hypothesis was rejected and the alternative accepted indicating that *there was a statistically significant relationship between the dominance of bulls and A.I. utilization.*

The relationship between the utilization of A.I. and the dominance of bulls in this study was inverse. Where bull dominance was high A.I. utilization was low. Whereas natural service flourishes where the A.I. service is wanting, the use of bulls was not based on merit but convenience. That technology inavailability constrains its utilization is also supported by other studies (Fliegel, 1989; World Bank, 1992).

Table 24

A.I. Utilization By Bull Dominance (N=210)

A.I. Utilization	Bull		Dominance			Total
	V. Low	Low	Moderate	High	V. High	
User	9	7	0	3	1	20
Non User	6	16	9	52	107	190
<b>Total</b>	<b>15</b>	<b>23</b>	<b>9</b>	<b>55</b>	<b>108</b>	<b>210</b>
$\chi^2$ calc. = 67.294	df = 4	$\chi^2$ crit. = 0.86		p<0.05		

4.2.2.2 *Extension Education Coverage*

The Chi-square results presented in Table 25 indicated a higher calculated value (7.558) compared to the critical value (4.95) at p<0.05 and one degree of freedom.

Table 25

A.I. Utilization By Extension Education Coverage (N=210)

A.I. Utilization	Farmers' Assessment of Coverage		Total
	Effective	Not Effective	
Yes	10	10	20
No	42	148	190
<b>Total</b>	<b>52</b>	<b>158</b>	<b>210</b>
$\chi^2$ calc. = 7.558	df = 1	$\chi^2$ crit. = 4.95	p<0.05

Thus the null hypothesis was rejected and the alternative accepted indicating that

there was a statistically significant relationship between extension education coverage and A.I. utilization. That extension education positively influences adoption and utilization of technologies has been established by other studies (Chitere, 1985). In the case of A.I. therefore, the more educated the farmers are on the importance of this technology, the more they would be expected to utilize it especially in the absence of other limiting factors.

#### 4.2.2.3 Heat Detection Ability

Since the Chi-square value obtained (11.627) was higher than the tabulated value (0.19) at  $p < 0.05$  and two degrees of freedom, the null hypothesis was rejected and the alternative accepted indicating that *there was a statistically significant relationship between heat detection and A.I. utilization*. This meant that the better the heat detection ability, the higher the rate of A.I. utilization.

Table 26

#### A.I. Utilization By Farmers' Ability to Detect Heat (N=210)

A.I. Utilization	Ability to Detect Heat			Total
	V. High	High	Low	
User	19	0	1	20
Non User	131	58	1	190
Total	150	58	2	210
$\chi^2$ calc. = 11.627	df = 2	$\chi^2$ crit. = 0.19	p < 0.05	

#### 4.2.2.4 Farmers' Knowledge of A.I.

Since the Chi-square value obtained (11.444) was higher than the critical value of 1.33 at  $p < 0.05$  and two degrees of freedom, the null hypothesis was rejected and the alternative accepted indicating that *there was a statistically significant relationship between the farmers' knowledge of A.I. and A.I. utilization*. This finding supports Mbugua's (1996).

Table 27

#### A.I. Utilization By Farmers' Knowledge of A.I. (N=210)

A.I. Utilization	Knowledge			Score	
	V. Low	Low	High	V. High	Total
User	0	0	2	18	20
Non User	0	14	80	96	190
Total	0	14	82	114	210
$\chi^2$ calc. = 11.444	df = 2	$\chi^2$ crit. = 1.33		$p < 0.05$	

#### 4.2.2.5 Milk Marketing

As shown in Table 28, the calculated Chi-square value (14.258) was higher than the tabulated value (2.42) at  $p < 0.05$  and three degrees of freedom. Thus the null hypothesis was rejected and the alternative accepted indicating that *there was a statistically significant relationship between the farmers' satisfaction with milk marketing and A.I. utilization*.

Table 28

A.I. Utilization By Farmers' Satisfaction with Milk Marketing (N=210)

A.I. Utilization	Level of Satisfaction				Total
	High	Moderate	Low	V. Low	
Users	10	7	3	0	20
Non Users	45	32	85	28	190
Total	55	39	88	28	210
$\chi^2$ calc. = 14.258	df = 3	$\chi^2$ crit. = 2.42		p < 0.05	

Where farmers are satisfied with the marketing of milk, they are more likely to utilize A.I.. Conversely, where milk marketing is unreliable, A.I. would be shunned.

#### 4.2.2.6 Record Keeping

Since the results (see Table 29 below) indicated a higher Chi-square value (16.665) compared to the critical value (0.19) at  $p < 0.05$  and three degrees of freedom, the null hypothesis was rejected and the alternative accepted showing that *there was a statistically significant relationship between record keeping and A.I. utilization.* Recalling that the majority of farmers (72.4 %) did not keep records (see Table 14), it seemed logical to infer that poor record keeping was associated with low utilization of A.I. by Bomet farmers.

Table 29

*A.I. Utilization By Record Keeping Scores (N=210)*

A.I. Utilization	Record Keeping Scores				Total
	V. Low	Low	High	V. High	
User	0	1	5	14	20
Non User	2	71	65	52	190
Totals	2	72	70	66	210
$\chi^2$ calc. = 16.665	df = 3	$\chi^2$ crit. = 0.19		p < 0.05	

## CHAPTER 5

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter outlines the summary, conclusions and recommendations pertinent to the study. It is given in the order in which the objectives were stated. The conclusions and recommendations were derived from the findings.

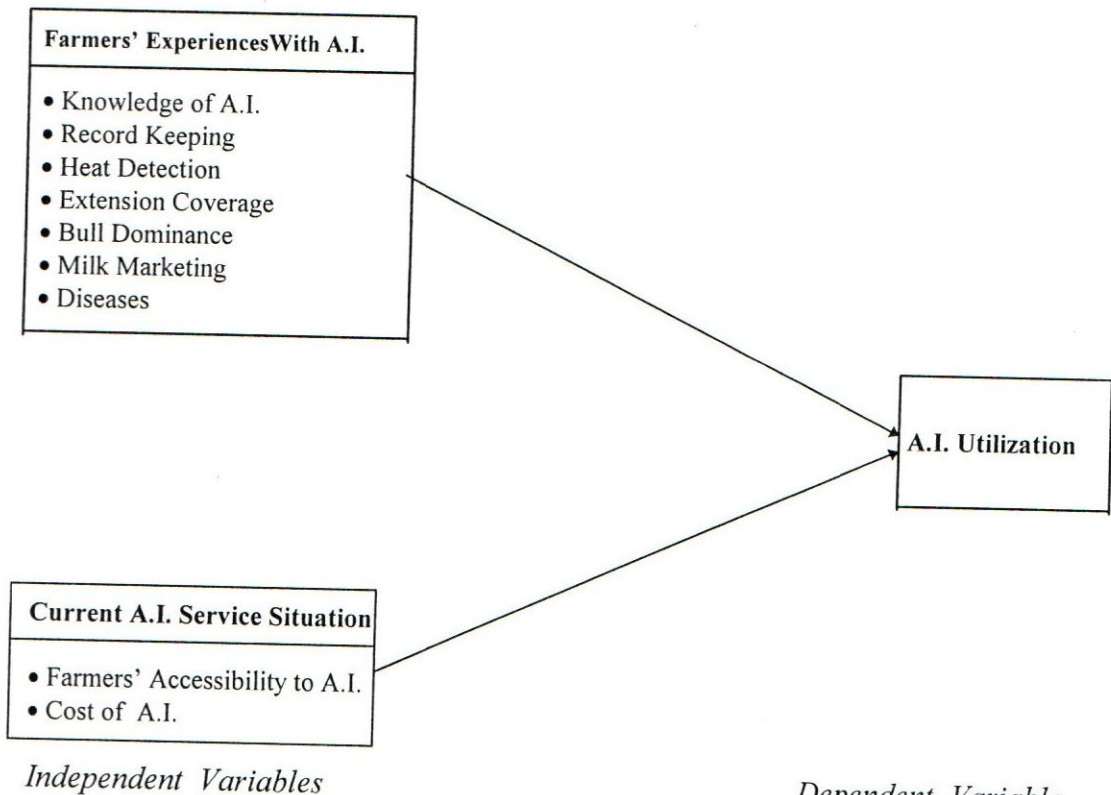
#### 5.1 Summary

Nearly half of the farmers interviewed (49.5 %) were in the age cohort 41-60 years while 31.9 % were 21-40 years old. The remaining were over 60 years old. Male farmers made up 84.3 % of the sample implying gender imbalance in the management of the sub-sector. Most farmers (68.6%) had either primary level of education or none. Some 64.3 % of the farmers had two steady income sources while the rest had either one, three or four sources. Of the 210 farmers, 71 % of them had no vocational training while 29 % did.

Over three quarters (77.6 %) of the farmers acknowledged the dominant role played by bulls in comparison to A.I.. Fourteen (14) diseases affecting dairy productivity were reported with varying frequencies and 53.8 % of the farmers knew the extension workers in their areas, but 65.6 % had not been visited by them. This portrayed little contact between farmers and the extension, a situation that could be

detrimental to farming success. The farmers had a high average knowledge score (3.93 out of a maximum of 5) with 71.4 % of them being able to easily detect cows on heat. Although Sotik KCC bought 71.9 % of the farmer's milk, 42.5% of them were dissatisfied with what it paid for the commodity.

Record keeping was found greatly wanting as 72.4 % of the farmers kept no records at all and 27.6 % who kept milk records did so intermittently. Some 81.9 % of the farmers reported varying degrees of difficulty pursuant to accessibility to A.I. while 88 % of them said the cost of A.I. was either high or very high implying many prospective users of A.I. may have been limited by cost. Some 55 % of the farmers reported that A.I. agents were either efficient or very efficient while 45 % said they were either inefficient or very inefficient. Statistically significant associations were found between A.I. utilization and the farmers' experiences with A.I. Also important were the farmers' accessibility to A.I. and its cost. Figure 2 (below) presents a summary of the factors that were found to be related to A.I. use.



*Figure 2: A Revised Conceptual Model of Factors Related to A.I. Use in Bomet*

According to the respondents, the obstacles to A.I. use in their order of decreasing importance were non-availability of A.I., limited knowledge of A.I., high cost of A.I., bull dominance and diseases.

## 5.2 Conclusions

From the findings of this study, the researcher concluded that

- i) The 9.5 % rate of A.I. use in Bomet was low for a district in which A.I. was available for over 40 years.

- ii) Farmers' experiences with A.I. are very important in determining its use. The more positive the experiences, the higher the A.I. utilization.
- iii) Factors such as non-availability of A.I. services, limited knowledge, high cost of A.I., dominance of bulls and diseases affected A.I. utilization.

### **5.3 Recommendations**

The resolution of the A.I. use dilemma depended on the following recommendations:

- a) Better management of the independent variables clustered as farmers' experiences (FEs) with A.I. with a view to
  - i) aggressively promoting extension education coverage, for instance, through field days, farmers' seminars, demonstrations and farmers' workshops. This would make farmers more knowledgeable and diminish the exaggerated importance of bulls.
  - ii) focusing more attention on record keeping.
  - iii) improving milk marketing. Specifically, milk payments to farmers should be prompt.
  - iv) improving disease control particularly for exotic dairy genotypes which are more predisposed to diseases than their indigenous counterparts.

- b) Better management of the A.I. service situation with a view to
  - i) making A.I. more accessible to the majority of farmers especially by deploying more agents to rural market centres. Mobility for the agents should also be addressed.
  - ii) making A.I. affordable to more clients. The government, for instance, could encourage more players in the field of A.I. provision. With competition, farmers would not only find it easier to get the service but would also let it fairly cheaply.

In certain areas, farmers were not keen to use A.I. allegedly due to incompatibility with their culture. It is recommended that a further study be carried out to establish the impact of culture on A.I. adoption.

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## QUESTIONNAIRE

(Factors Related to the Utilization of Artificial Insemination By Small-holder Dairy Farmers in Bomet District).

Case Number .....

### Farmers' Experiences with A.I., their Personal Characteristics and A.I. Services Situation

Directions: Kindly provide answers to the following items. Instructions are found in the brackets after each question or statement.

#### Heat Detection Ability

1. Concerning heat detection (please tick one)
  - a) Most of the time I can tell if a cow is on heat ( )
  - b) I sometimes fail to tell whether a cow is on heat ( )
  - c) Cows on heat escape my notice ( )
2. Monitoring of cows for heat signs (please tick one)
  - a) Usually done by self ( )
  - b) Usually done by workers ( )
  - c) Other (specify ..... ) ( )
3. Usual time for insemination (please tick one)
  - a) Immediately heat is noticed ( )
  - b) Mid-way during the heat period ( )
  - c) Late during the heat period ( )
4. The following are signs seen in cows on heat. Using the brackets, kindly RANK them 1 through 5 with 1 being the sign that you consider most familiar for timing insemination and 5 being the least familiar.

- a) Reduced milk production ( )
- b) Restlessness. May break fences in search of the bull ( )
- c) Excitedness (nervousness) ( )
- d) The cow mounts other animals ( )
- e) The cow stands to be mounted ( )

**To access A.I. Service (please tick one)**

- 5. Means of calling for A.I. service ( )
  - a) Telephone ( )
  - b) Personal car / motorbike ( )
  - c) Bicycle ( )
  - ( )
  - d) Public service vehicle (matatu) ( )
  - e) Walking ( )
- 6. Using the means above ( )
  - a) I am usually able to get inseminators on time ( )
  - b) Delays occur occasionally ( )
  - c) Delays occur often ( )
- 7. Suggestions to improve contact with inseminators ( )

.....

.....

**Farmers' Knowledge of A.I.**

- 8. The following are facts concerning A.I. Please indicate how much you agree or disagree by circling one of the numbers following each statement. Please mark each item using the following responses categories.

- 1 = STRONGLY DISAGREE
- 2 = DISAGREE
- 3 = UNCERTAIN
- 4 = AGREE
- 5 = STRONGLY AGREE

Example

Circle one

Farm records are good

1 2 3 4 (5)

By circling “5”, the respondent strongly agrees with the statement that “farm records are good”. Please indicate the extent to which you agree or disagree with the following:

- a) A.I. employs the use of high quality bulls 1 2 3 4 5
- b) By using A.I., a cow can produce a calf yearly 1 2 3 4 5
- c) A.I. controls breeding diseases 1 2 3 4 5
- d) A.I. eliminates the cost of keeping bulls 1 2 3 4 5
- e) A.I. improves milk production 1 2 3 4 5
- f) A.I. offsprings are generally of high quality 1 2 3 4 5
- g) A.I. eliminates uncontrolled mating 1 2 3 4 5
- h) Using A.I., many cows can be made to calf down together 1 2 3 4 5
- I) Through A.I. superior bulls can be used globally 1 2 3 4 5
- j) In A.I., a bull inseminates more cows than under natural mating 1 2 3 4 5
- k) Correct timing for insemination is important for A.I. success 1 2 3 4 5
- l) Heat observation is done each morning, afternoon and evening 1 2 3 4 5

**Record Keeping for Individual Cows**

9. Do you keep any records for your cows? (Please tick one)
- a) Yes ( )
- b) No ( )

If yes, which ones? .....

.....

If not, why? .....

.....

10. Means of identifying your cows (please tick all that apply)
- a) Ear tags ( )
- b) Neck straps ( )
- c) Ear notches ( )
- d) Ear tattoos ( )
- e) Names ( )

11. The following are statements that are related to record keeping. Please indicate how much you agree or disagree by circling one of the numbers following each statement. Please mark each item using the following response categories.

- 1 = STRONGLY DISAGREE
- 2 = DISAGREE
- 3 = UNCERTAIN
- 4 = AGREE
- 5 = STRONGLY AGREE

Circle One

- a) Success of A.I. depends on proper cow identification 1 2 3 4 5
- b) Record keeping for individual cows is important for A.I. 1 2 3 4 5

- c) Records show the heat cycle of each cow 1 2 3 4 5
- d) Records show the insemination history 1 2 3 4 5
- e) Records show calving trends 1 2 3 4 5
- f) A cow's calendar helps in telling the next heat 1 2 3 4 5
- g) Records help in identifying breeding problems 1 2 3 4 5
- h) Records help in reducing calving intervals 1 2 3 4 5

**Cost of A.I. Service**

- 12. Cost of A.I. (please tick one)
  - a) Too high ( )
  - b) High ( )
  - c) Low ( )
- 13. Pay for A.I. services in my farm comes from
  - a) Milk income ( )
  - b) Other sources (please specify ..... ) ( )
- 14. How should A.I. service be paid for? (Please tick one)
  - a) Farmers to pay on delivery ( )
  - b) The Dairy co-operative societies to pay and recover from farmers ( )
  - c) Other (please specify ..... ) ( )
- 15. Is cost a major factor in deciding whether or not to use A.I. in your farm ?
  - a) Yes ( )
  - b) No ( )
  - c) Uncertain ( )

If yes, kindly explain why .....

.....

**Type of A.I Agency**

16. (i) A.I. services in my farm come from (please tick whichever applies)
- a) Government ( )
  - b) Private individuals ( )
  - c) Non-governmental organizations ( )
  - ii) Why do you prefer the named agency? .....

.....

For the A.I. agency named, I pay KShs..... per set of inseminations.

- iii) How efficient is the agency? (please tick one)
- a) Very efficient ( )
  - b) Efficient ( )
  - c) Moderately efficient ( )
  - d) Not efficient ( )

17. My satisfaction with the service rendered (please tick one)
- a) Very satisfied ( )
  - b) Satisfied ( )
  - c) Not satisfied ( )

**A.I. Service Availability**

18. Availability of A.I. service (please tick one)
- a) Mostly available ( )
  - b) Occasionally available ( )
  - c) Rarely available ( )

If “occasionally or rarely available”, kindly tick any of the following which may explain the situation.

- a) Occasionally there is no semen ( )
- b) Sometimes there is no liquid nitrogen ( )
- c) Occasionally inseminators cannot be found ( )
- d) Sometimes inseminators fail to respond due to lack of transport ( )
- e) Inseminators may arrive late ( )
- f) Any other (please explain ..... ) ( )

19. Any suggestions to make the A.I. service more effective?.....  
 .....

**Bull Dominance**

Using the following response categories, please answer items 20 - 25.

- 1 = STRONGLY DISAGREE
- 2 = DISAGREE
- 3 = UNCERTAIN
- 4 = AGREE
- 5 = STRONGLY AGREE

Circle one

- 20. Local bulls often serve cows before A.I. service is obtained 1 2 3 4 5
- 21. Local bulls are better because they are always available 1 2 3 4 5
- 22. Insemination by local bulls is followed by conception most of time 1 2 3 4 5

23. Local bulls can spread breeding diseases 1 2 3 4 5
24. It is difficult to prevent local bulls from serving cows 1 2 3 4 5
25. Castration of all local bulls would be a good thing 1 2 3 4 5

**Milk marketing**

26. Milk marketing (please tick one)
- a) Sotik KCC ( )
- b) Local sales ( )
- c) Other (please specify ..... ) ( )
27. (i) Satisfaction with milk marketing (please tick one)
- a) Very satisfied ( )
- b) Just satisfied ( )
- c) Dissatisfied ( )
- ii) If “just satisfied or dissatisfied”, kindly tick one of the following which best explains your situation:
- a) Poor pricing ( )
- b) Delay in payments ( )
- c) Other (please state ..... ) ( )
- iii) Do the above, (a) and (b), affect your use of A.I.?
- a) Yes ( )
- b) No ( )

**Extension Education Coverage**

28. Do you know the livestock extension workers in this area?
- a) Yes ( )
- b) No ( )

29. (i) When were you last visited by an extension agent? (please tick one)
- a) This week ( )
  - b) Last week ( )
  - c) Last month ( )
  - d) Last year ( )
  - e) Cannot remember ( )
  - f) Never ( )

- ii) Do you get lessons concerning A.I. from extension workers?
- a) Yes ( )
  - b) No ( )

30. Which of the following have you attended at *least twice* over the last one year?

(Please tick all that apply)

- a) Farmers' workshops ( )
- b) Field days ( )
- c) Demonstrations ( )
- d) Farmers' tours ( )
- e) Agricultural shows ( )
- f) Farmers' seminars ( )
- g) Residential training at F.T.C. ( )

31. The following are sources of information for farming. Kindly rank them 1 through 5 with 1 being the most common and 5 the least.

\_\_\_\_\_ a) Agricultural shows

\_\_\_\_\_ b) Radio

- \_\_\_\_\_ c) Newspapers
- \_\_\_\_\_ d) Magazines
- \_\_\_\_\_ e) Extension workers
- \_\_\_\_\_ f) Other farmers

**Diseases**

32. Disease occurrence on the farm (please tick accordingly)

- a) Tick-borne diseases
  - i) East Coast Fever (ECF) ( )
  - ii) Anaplasmosis ( )
  - iii) Red water (Babesiosis) ( )
  - iv) Heart water ( )
  - v) Others (specify ..... ) ( )
- b) Other diseases (please tick accordingly)
  - i) Milk Fever ( )
  - ii) Mastitis ( )
  - iii) Foot Rot ( )
  - iv) Helminthiasis (worms) ( )
  - v) Bloat ( )
  - vi) Abortions ( )
  - vii) Dystocia (difficult birth) ( )
  - viii) Foot and Mouth ( )
  - ix) Anthrax ( )
  - x) Diarrhoea ( )
- c) Disease control measures (please tick accordingly)
  - i) Weekly dipping/home spraying done ( )

- ii) Vaccinations done at least once a year ( )
  - iii) Milkers use disinfectants ( )
  - iv) Milkers use udder clothes ( )
  - v) Strip cup used ( )
  - vi) Milking jelly is used ( )
  - vii) Milking is by stripping ( )
  - viii) Milking times strictly observed ( )
  - x) Teat dipping done after milking ( )
  - x) Udder infusions done during drying off ( )
  - xi) Drenching done quarterly ( )
  - xii) Pygrease used regularly ( )
- d) Animal health care providers (please tick all that apply)
- i) Veterinary officer ( )
  - ii) Livestock officer ( )
  - iii) Animal health assistants ( )
  - iv) Crops officers ( )
  - v) Veterinary Scouts ( )
  - vi) Dip attendants ( )
  - vii) A.I. personnel ( )
  - viii) Self ( )
  - ix) Other people in the village (namely ..... ) ( )
- e) Tick control (please tick accordingly)
- i) Use a plunge dip
  - ii) The plunge dip is
    - a) Communal ( )
    - b) My own ( )
    - c) Government's ( )

d) Somebody else's ( )

The fee paid per animal per dipping is KShs.....

This fee is a) Affordable ( )

b) Not Affordable ( )

The acaricide used is .....

If using hand-sprays (please tick according)

i) Use knapsack sprayer ( )

ii) Use a hand-pump ( )

iii) The sprayer is a) Mine ( )

b) Borrowed ( )

c) Hired ( )

The acaricide used is .....

One 100 mls bottle sprays ..... cows

### A.I. Utilization

33. a) Ever Used A.I.? (i) Yes ( )

(ii) No ( )

b) Currently use A.I.? (i) Yes ( )

(ii) No ( )

If yes, kindly answer the following by ticking one:

- a) My level of A.I. use is
- (i) High (use A.I. each time heat is detected) ( )
- (ii) Moderate (use A.I. 50% of the time) ( )
- (iii) Low (use A.I. less than 50% of the time) ( )

**Farmers' Personal Characteristics**

34. Farming (please tick one)
- a) Full time farmer ( )
- b) Part time farmer ( )
35. Experience in dairy farming (please tick one)
- a) Less than 5 years ( )
- b) 6 - 10 years ( )
- c) Over 10 years ( )
36. Highest level of formal education (please tick one)
- a) None ( )
- b) Primary ( )
- c) Secondary ( )
- d) Post secondary ( )
37. Attended vocational training? Please tick one)
- a) Yes ( )
- b) No ( )

38. Marital status (please tick one)
- a) Never married ( )
  - b) Married ( )
  - c) Divorced ( )
  - d) Widowed ( )
  - e) Separated ( )
39. Usual sources of income (please tick one)
- a) None ( )
  - b) Formal employment ( )
  - c) Dairy farming ( )
  - d) Business e.g. kiosk ( )
  - e) Other (please specify ..... ) ( )
40. Gender (please tick one)
- a) Male ( )
  - b) Female ( )
41. Date of birth .....

Thank you for sparing your precious time for me. God bless you so much.