Factors affecting the implementation of acquired skills and knowledge presented to farmers at Denman Rural Training Centre in Gaborone Agricultural Region, Botswana

By

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DEDICATION

This Thesis is dedicated to my beloved wife Beauty, and my three sons

Godwill, Morebodi and Modiri

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I praise God's name for guiding and keeping me safe during my entire study period.

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ABSTRACT

Factors affecting the implementation of acquired skills and knowledge presented to farmers at Denman Rural Training Centre in Gaborone Agricultural Region, Botswana

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The impact of farmer training in Botswana in terms of its influence on farmers' production efficiency is not well known. The objectives of this study have been to investigate the factors that determine the adoption and non-adoption of agricultural technologies, establish how farmers contribute to the training program, and determine the impact of the knowledge gained from the training program.

A structured questionnaire was administered to 223 respondents, from these respondents 153 farmers attended training, twenty-one respondents were never trained, thirty-three were frontline extension agents, nine support staff, five instructors and two managers. The respondents were from five districts of Kgatleng, Kweneng south, and Kweneng north, Kweneng west, and Southeast.

The study revealed that intervening variables are the determinants of behaviour change, and the effect of the independent variables is manifested in them. It was established that age, education and farm size seems to have an influence on adoption of technologies. While gender, farming experience, land ownership, and membership to farmer organization did not influence adoption of technologies.

The results indicated that most of the farmers were not involved in identifying the courses they attended, as indicated by 65 percent of the respondents. This was confirmed by 80 percent of respondents who indicated that extension agents suggested the courses.

The findings of the study show that most of the respondents agreed that knowledge gained from training is very useful. This was reported by 45 percent of respondents who indicated moderate impact on their production due to training, 46 percent indicated that they used the knowledge often, while 36 percent of respondents never used the knowledge since training.

The most important factor revealed by the study contributing to non-adoption of technologies is lack of resources. This is related to need, perception and participation of farmers in identifying the courses they attend.

During follow-ups made by extension staff on trained farmers, the results show that the status of acquired knowledge is usually negative; this was stated by 64% of the respondents, as such indicating that there was no implementation. This affirms the fact that 36 percent of respondents never used the knowledge, while 36 percent did not realize any impact at all on their production efficiency due to training. The study concluded that for training to be effective, extension has to address the needs and perception of trainees. This will address lack of resources, which contribute to non-adoption of technologies. Compatibility of acquired knowledge to the situation of respondents is another factor to be considered in training. It is concluded that the needs of respondents determine adoption behaviour, which finally influences production efficiency.

Based on the findings of this study, factors identified to influence adoption and non-adoption of technologies and issues raised, it is recommended that more research should be done to address implementation of acquired knowledge and how to measure the impact of training.

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BACKGROUND AND MOTIVATION

1.1 Introduction

Botswana is a landlocked country with a total area of approximately 581,730 sq km. It shares its borders with South Africa, Namibia, Zambia and Zimbabwe. The estimated population according to the 2001 census is 1.7 million, with most of the people residing in rural areas. The majority of the people derive their livelihoods from agricultural related activities, with maize and sorghum being the major crops in the country. Agriculture in Botswana is dominantly at a subsistence level.

The government of Botswana through the Ministry of Agriculture, Department of Crop Production and Forestry, encourages farmers to change their attitude of producing at a subsistence level to at least a semi-commercial level. The emphasis is also on the need to reduce the amount of food products imported into the country and to improve the income for rural communities. In order for these to be realized, there is a strong need for change in the attitudes and production practices of the predominantly subsistence farmers.

Since the establishment of the first rural training centre in Botswana in 1967, extension has been trying to develop farmers through farmer training courses. The concern for government is that, even though training has been offered; its impact on the attitude and production practices of trainees is not evident. As such it is important to evaluate the impact of training offered, and find out if extension has been addressing the needs of farmers in their training.

The report of Tahal Consulting Engineers (2000) indicated that despite the importance of the agricultural sector in the country, its contribution to the Gross

Domestic Product (GDP) continues to decline. Based on this information and the poor impact of training on farmers' production efficiency, the objectives of this study were: To investigate the factors that determine adoption and non-adoption of agricultural technologies; to investigate the extent to which farmers contributed to the development of the training programs and the criteria for selecting course participants. The study also determined the impact of knowledge and skills gained from the training program on the farming practices of the trainees.

Hypothetically, the study assumed that the poor impact of training on farmers' production efficiency is a function of non-adoption / implementation of technologies by farmers, and also that training offered does not address the needs and perception of trainees. Based on the findings of the study, recommendations have been made to improve farmer training.

1.2 Rationale / Background

The organized and formal Agricultural Extension service in Botswana began in 1947 with the Co-operator Plot Scheme in the Bakgatla Tribal Territory. From this modest beginning grew the highly effective Pupil Farmers' Scheme, an extension scheme that was based on the individual approach to farmers. For over years, this individual approach where one Agricultural Demonstrator (Frontline Extension Worker) regularly advised thirty to fifty farmers – served as the keystone to extension development efforts in Botswana. For many years, this intensive form of extension was well justified, serving to advance key farmers in their practices and by example, teaching many of their neighbours (SARCCUS Report, 1971:9).

However, today the Division of Extension has escalated its efforts beyond the individual extension approach. It has become increasingly evident that the individual approach has nearly reached its limits. The Division of Extension in Botswana presently is composed of three distinct, but closely integrated areas of

operation namely: field extension staff; 4-B or youth movement and rural training centres.

There are five rural training centres in Botswana. Denman Rural Training Centre (DRTC) was the first centre established in 1967, as such marking the first training of farmers in crop production aspects on a large scale. The purpose of the Centre is to fulfill one of the Extension Division's key result areas of transfer of technology. While the field extension staff transferred technology through other methods like demonstrations, on the other hand, all farmers and youth involved in agriculture are sent for training at rural training centre. Training of farmers in Botswana is done annually on many appropriate technologies released by research for resource poor farmers, but the experience is that agricultural production in the rural areas remained very low and the rural community is threatened by food shortage.

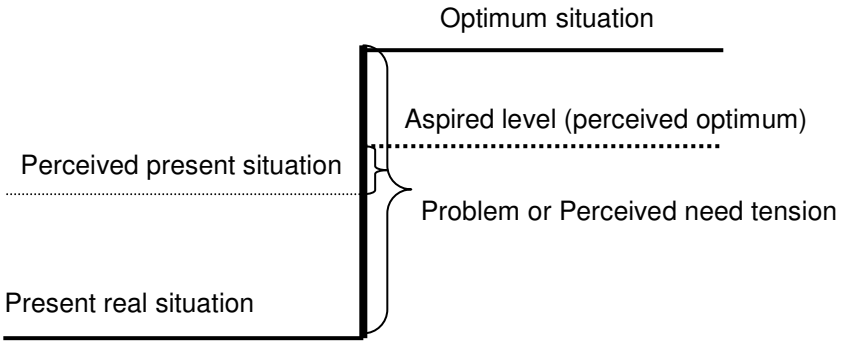
The procedure for farmers training at present is that frontline extension workers and subject matter specialists consult with farmers and farmers committees to identify relevant courses then submit a list of courses at the district and regional level. The courses are compiled and submitted to the rural training centre to be scheduled in the annual program. Farmers are then identified and sent to attend the different courses throughout the year. What has been observed from farmers, who have attended courses, is that there is less or no implementation of practices with regard to the new acquired knowledge or technologies and no or very little improvement in their production efficiency. This confirms the report of TAHAL Consulting Engineers (2000) that despite the importance of the agricultural sector in the country, its contribution to the GDP continues to decline. Its current contribution to the GDP is 2.6 percent. This is because of low and erratic rainfall and endemic droughts, which severely hamper rain-fed, crop production.

One important aspect to note is that farmers do not pay for the training courses, but the Department of Crop Production and Forestry feel obligated to train farmers as a means of development to assist in technology adoption, and has to make justification for funding of farmer training courses every year. Due to the limitations or shortcomings mentioned so far about farmers training courses, a study was conducted to evaluate the impact of training presented at DRTC on farmers' production efficiency in Botswana.

1.3 Statement of the research problem

Time and resources have been spent at DRTC since 1967 in Botswana to develop agriculture. The major focus has been training of farmers to increase the transfer of technology on improved agricultural methods. Courses are conducted annually for farmers on different agricultural aspects to improve their production efficiency, but there is a concern about non-adoption or implementation of the acquired knowledge or technology. Since the inception of farmers training, there is only one study done by Montsho (2002). The study focused on the extent to which horticultural farmers applied what they have been taught. Unfortunately, this study provided only limited information. In relation to what has been done, this study was conducted to evaluate the impact of training on farmers' production efficiency, i.e. looking at all courses offered at DRTC to supplement the previous study.

A problem perception or need tension according to Düvel (1982, 1991 &1995) is defined as the perceived discrepancy between the present situation and the desired situation or level of aspiration. This discrepancy scenario is illustrated in Figure 1.1.



(**Source**: Düvel, 1991)

Figure 1.1: Diagrammatic illustration of problem magnitude or need tension as influenced by perception

According to Figure 1.1 above, the aspects of problem perception, where a problem is regarded as being the difference between "what is" (present situation) and "what can be" or is strived at (desired situation). It shows how the extent or magnitude of the problem (or need tension) is determined by the extent of the gap between the existing and the desired situation. In this research study, the poor impact of training on farmers' production efficiency means that there is non-adoption and therefore no implementation of the new acquired knowledge, as a result of farmers' possible overestimating of their production efficiency practices due to misperception. In this regard the perceived scope of the problem or potential need tension is reduced. On the other hand, if there is limited knowledge concerning the optimum that is achievable when implementing the new acquired knowledge, the potential problem and need can be further reduced to an insignificant level.

In other instances, it is possible that the problem is correctly perceived, but for various reasons the individual is satisfied with the situation. The opposite is also possible, namely that the individual under-rates himself in terms of efficiency, and in extreme cases the goal-object may consequently appear out of reach or unattainable, resulting in resignation or frustration on the part of the individual.

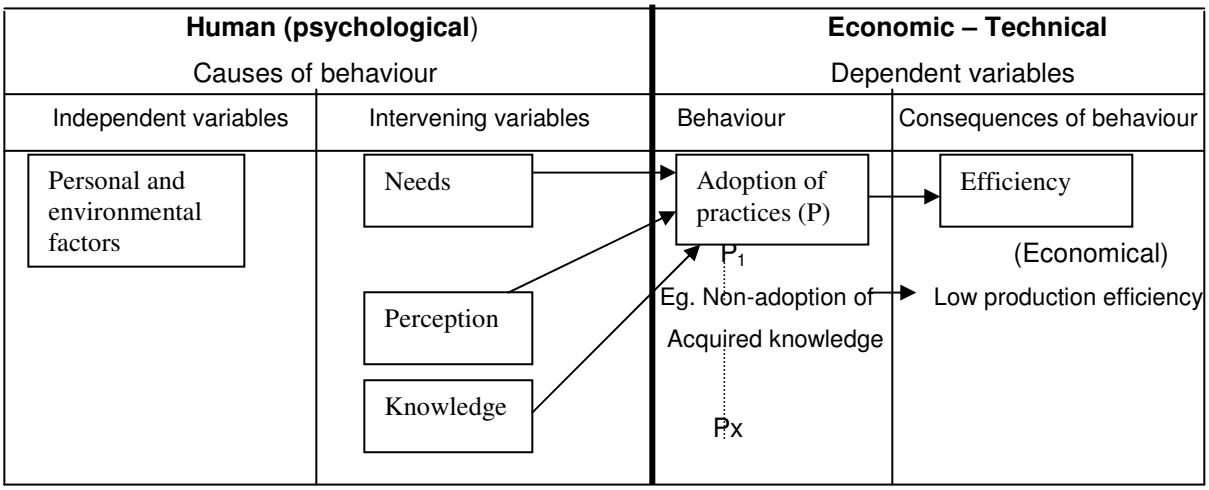
The adult education process according to Bembridge (1991:48) involves a series of tasks arranged in an ordered sequence, structured around a specific subject, which progresses from the known to the unknown, from the simple to the complex, and from the concrete to the abstract. Learning is thus a change in knowledge or behaviour as a result of the experience gained through a specific learning situation. From an extension point of view, learning has only effectively taken place if it results in a change in knowledge or behaviour by the farmer in terms of farming practices or other objectives, which will improve his income and living standards.

1.4 The purpose of the study

Training is one of the critical components of human resource development, and since resources for training are becoming scarce it is more important to evaluate training programs and training events in order to ensure that training is effective, that funds are being utilized well, and that further funding is justified (Horton, Ballantyne, Peterson, Uribe, Gapasin & Sheridan, 1993). The purpose of the study was to evaluate the impact of training presented at DRTC on farmers' production efficiency. *Evaluation* as noted by Horton *et al* (1993:1) is judging, appraising, or determining the worth, value, or quality of proposed, on-going, or completed research or project, generally in terms of its relevance, effectiveness, efficiency, and impact.

1.5 The objectives of the study

In the context of the problem under review that is, the poor impact of training, the assumed interdependency of behaviour, the consequences of behaviour and behaviour determining variables in relation to adoption or non-adoption of the acquired knowledge or technology can be illustrated as shown in Figure 1.2 below.



(Source: Düvel, 1991**)**

Figure 1.2: The relationship between behaviour-determining variables, behaviour (e.g. non-adoption of acquired knowledge) and its consequences

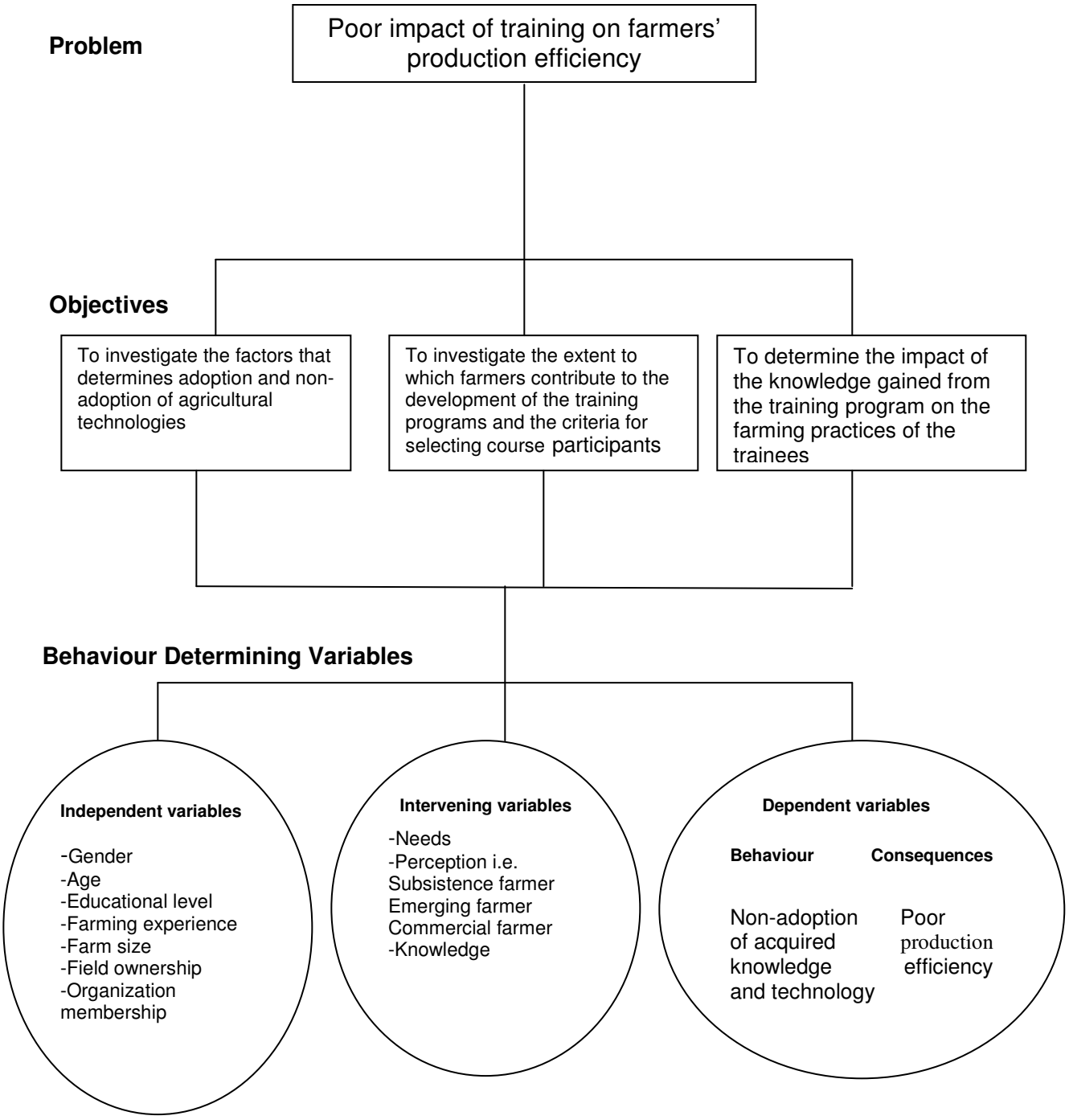
The assumption implied in the model (Figure1.2) is that all potential causes of adoption (including both adoption and non-adoption) are need, perception or knowledge related. Against the above background the following objectives concerning non-adoption of acquired knowledge or technology were formulated:

1.5.1 To investigate the factors that determine adoption and non-adoption of agricultural technologies (reasons)

1.5.2 To investigate (a) the extent to which farmers contribute to the development of the training programs and (b) the criteria for selecting course participants

1.5.3 To determine the impact of the knowledge gained from the training program on the farming practices of the trainees. Primarily those who adopted the practices from the training program.

To establish a link between the problem, its objectives and behaviour determining variables, a diagrammatic illustration was drawn as shown in Figure 1.3.



(Source: Sebadieta, 2006)

Figure 1.3: The link between the problem, objectives and behaviour determining variables

The above model (Figure 1.3) assumes that to address the problem properly, the study has to address each objective in relation to the independent and intervening variables, which determines behaviour and its consequences. In order to address the behaviour determining variables, basing on the above model (Figure 1.3) the study formulated the following hypotheses and research questions, which are related to each objective.

Hypothesis one: Poor impact of training on farmers' production efficiency is a function of non-adoption or implementation of acquired knowledge or technology.

Hypothesis two: Training offered at Denman Rural Training Centre does not address the intervening variables namely the needs and perception of participants.

1.5.4 Independent variables

According to Tolman (1967:279), the independent variables are the initiating causes of individual's action consisting of the environment entities presented to the individual actor at a given moment. This is indicated in Figure: 1.2 &1.3. He also enumerated conditions of drive arousal and such individual difference producing variables as heredity, age, and sex to the category of independent variables. Independent variables are assumed to act directly in determining intervening variables, which interact with dependent variables.

Gorfe (2004:45) indicated that in general, review of the literature indicates a greater degree of inconsistency of research results regarding the independent than the intervening variables. The intervening variables have been significantly related with the adoption behaviour of farmers, whereas the results of the studies conducted in regard to the independent factors are not all in agreement.

According to him some studies (Brown, Malecki, & Spector 1976; Omotayo, Chekwendu, Zaria, Yusuf, & Omenesa 1997; Bizimana, Nieuwoudt, & Ferrer 2002) reported positive relationships between age and the adoption behavior of farmers and the resulting production efficiency. Some other findings (Coop, 1958; Bembridge & Williams, 1990; Foltz & Chang 2002) indicate negative relationships. It is, however, generally assumed that younger people are more open to ideas than older ones and therefore, are believed to be relatively more likely to adopt agricultural technologies. Neel (1977:339) asserts that as a person become older, he is able to exist in a broader time perspective, which includes his past, present, and future, while the small child lives completely in the present and is determined in its behaviour by it.

Education according to Botha & Lombard (1991) must be seen in terms of training people for an unknown future, it should be empowering in the sense that it must first equip people to make effective decisions about their own lives and secondly it must furnish people to bring about commonly desired change. It is seen as a basic and crucial factor in changing attitudes of more traditional farmers, overcoming mutual distrust in inter-personal relations, hostility towards authority, lack of innovativeness, fatalism and limited aspirations.

Bembridge (1992) found with small-scale farmers in Venda that there is a positive correlation between their level of education and their management ability. According to him, it must be understood that a person who is not well educated, feels threatened by the onslaught of modern science because he cannot form a good understanding of the real significance of new recommendations and also cannot understand how he can benefit from it.

Education as human capital is expected to increase the adoption level of farmers. Rogers (1983:251) has also reported that earlier adopters have more years of education than the later adopters have. Although positive relations are found in most cases (Bembridge & Williams, 1990; Mensah & Seepersad, 1992; Foltz &

Chang 2002), significantly large number of studies does not show any relationship between the education level of the farm operator and his adoption behaviour. Studies conducted by Düvel & Botha (1999), Elias (1999), and Getahun, Muangi, Verkuiji, & Abdisekur (2000) are some examples. A negative relationship (Omotayo, Atala & Ogunwale, 1996) is also rarely reported.

Farming experience is a key element in agriculture. The assumption is that years of experience are positively correlated to farming success. The number of years the farm operator spent in farming will increase the experiential base and this should assist in making adoption decision (Abd-Ella, Hoiberg & Warren 1981:45). Such a consistent result is however not found in the review of literature. Experience is found to have no relation with adoption behaviour in some cases (Düvel & Botha, 1999; Zegeye, Tadesse, & Tesfaye 2001; Zegeye & Tesfaye, 2001) while it has been positively in some cases (e.g. Omotayo *et al*, 1997) and even negatively (e.g. Abd-Ella *et al*, 1981).

According to Abd-Ella et al, (1981:45), larger farm size means more resource and greater ability to take the risk involved in the adoption of recommended practices. Rogers (1983:252) has also generalized that early adopters have larger-sized units than later adopters. Review results are in agreement with this generalization, i.e. farm size is found to be positively related with adoption (Opare, 1977; Omotayo *et al*, 1997; Elias, 1999; Alene, Poonyth, & Hassan 2000; Zegeye *et al*, 2001; Getahun *et al*, 2000). Farm size does not show any relationship only in some cases (Getahun *et al*, 2000; Zegeye & Tesfaye, 2001) while it is negatively related in a single case.

1.5.5. Intervening variables

Tolman (1967:281) indicated that intervening variables are postulated explanatory entities conceived to be connected by one set of causal functions to the independent variables, on one side, and by another set of functions to the

dependent variables of behaviour, on the other side. On top of this, Neel (1977:159) pointed out that mental processes (intervening variables) were inferred determinants of behaviour tied objectively to the ultimate causes or stimuli on one hand and to the final act, on the other. The intervening variables considered in this study are mostly need and perception related. As indicated earlier, the results of previous studies in this area are consistent with expectations except in one case. Düvel & Scholtz (1986) found that perception of controlled selective grazing has not been related with adoption of recommended veld management practices. Association of need related variables (need compatibility, need tension) and adoption behaviour has been positive and significant. Studies by (Koch, 1986; Koch, 1987; Düvel & Botha, 1999) for example, found positive and significance relationships. Koch (1986) however found a negative relationship between perceived current efficiency and adoption. This means that adoption of agricultural practices is inhibited by problem misperception or by lack of clear perception.

Examples were found where perception of technology attributes is positively related to adoption behaviour (Düvel & Botha, 1999).

1.5.6 Dependent variables

Tolman (1967:281) defined the dependent variables as a combination of verbal, skeletal, and visceral reactions to the external stimuli. In this study the content variables to be confirmed by the study are the non-adoption of acquired knowledge and production efficiency.

1.6 RESEARCH QUESTIONS

The following research questions have been formulated:

1.6.1 What are the factors that determine adoption and non-adoption of technologies?

1.6.2 In what ways do farmers contribute to the development of the training programs and the criteria used to select course participants?

1.6.3 To what extent do trained farmers apply the acquired knowledge or technology?

1.7 SIGNIFICANCE OF THE STUDY

It is important to regularly evaluate training to determine its effectiveness in relation to improving production efficiency of farmers. The findings of this research will be useful to:

- District and Regional staff involved in training of farmers.
- The Department of Crop Production & Forestry as the funding source.
- Denman Rural Training Centre as a Training Institution
- Farmers as the clients or beneficiaries of training.

The study may also lead to a vigorous review of farmers' training in Botswana.

1.8 LIMITATIONS OF THE STUDY

The study focused on one training centre only, based in Gaborone agricultural region, out of five in the whole country. As such, it might not be representative enough given the diverse geographical and climatic conditions of Botswana. The factors of time frame and limited resources could not allow the researcher to conduct the study in more than one training centre. Only twenty-one farmers who have never attended courses were interviewed, and they were from the two districts of Kgatleng and Southeast. The reason being that, these were the only

two districts, which could identify farmers who have never been trained. There were only two managers who managed to return the questionnaires. These include the principal of Denman Rural Training Centre and one district agricultural officer.

1.9 MODELS OF ADOPTION BEHAVIOUR

There are several models of adoption behaviour. Commonly recognized ones include Düvel's model (1991), the Field Theory of Lewin (1951) and the Tolman model (1967).

1.9.1 Factors that determine adoption and non-adoption of agricultural technologies

Proof of the complexity of man lies in the great diversity of disciplines involved in the study of human behaviour such as Psychology, Sociology, Anthropology, Psychiatry, Economics etc., and the fact that in comparison to the technical and technological disciplines, relatively slow progress has been made in the real understanding of human behaviour (Atkinson, Atkinson, Smith, & Hilgard, 1985)

According to Düvel (1987:2), a theoretical background of behaviour change is essential in order to appreciate why certain information about the individual as human being is necessary before behaviour change can be brought about systematically. Of the many available theories and models that have been presented to try to explain this phenomenon and establish guidelines for the practical situation, the field theory of Lewin (1951), offers great possibilities. Only having some knowledge of the basic features of the field theory and the model for behaviour change emerging from it, can an understanding be developed of the aspects of variables that have to be determined in a situation survey.

The most basic feature of Lewin's (1951) field theory is that it regards behaviour (B) of an individual to be a function (f) of the total situation, viz. the life space (lsp) or cognitive field, which consists of both the condition of the individual (P) and the environment (E), factors which are closely interrelated. This can be formulated as follows: **B = f (lsp) = f (P, E).**
Cognition according to Atkinson *et al* (1985) refers to the mental processes of perception, memory, and information processing by which the individual acquires knowledge, solves problems, and plans for the future.

According to this theory, all causes of behaviour can be traced back to the psychological field, consisting of a constellation of mutually interdependent factors or forces, depending on circumstances, time, objectives and other factors.

This conclusion is based on recognition of the fact that man, in contrast with other creatures, enjoys freedom of choice to a considerable extent and therefore makes his own decisions. This results in what psychologists call plasticity of behaviour, i.e. the possibility that the same person in the same situation may make different decisions and can therefore behave in different ways. Hence also the realization among scientists that, as far as behaviour is concerned, it is possible only to make judgments of probability, not firm predictions. Knowledge of this field is a prerequisite for scientifically sound and goal-oriented extension or persuasion.

Behaviour in its simplest form can be regarded as a type of movement brought about by forces or energy resulting from a system in disequilibrium (Düvel, 1987:3). This energy is tied up in a field or constellation of forces originates from a need (system in tension) and finds expression in movement towards a goal or objective as a means of need satisfaction. Seen in this way, needs are the causes of all behaviour, and all behaviour can, except for reflexive or frustrated behaviour, be defined as goal-oriented. Tolman (1967:296) indicated the following basic elements or principles in relation to behaviour.

(i) Behaviour is intentional i.e. behind the specific behaviour or action; there must be a reason or motive.

(ii) Behaviour is guided by expectations concerning the environment. These expectations are based on either observations of the specific stimulus situations (sense perception) or on earlier experiences, which present the individual with an idea as to which methods (means) should be used in order to achieve the one or other goal.

(iii) The immediate precursor to action is the "behaviour space" which Tolman (1967:296) defines as "a particularized complex of perceptions (memories and inferences) as to objects and relations and the "behaving self", evoked by the given environmental stimulus situation and by a controlling and activated belief-value matrix and implies a mental vicarious trial-and-error behaviour. The objects can have positive or negative valences.

Düvel (1995:45) still emphasizing on the importance of the field theory indicated that behaviour change can be brought about and directed by changing the force field i.e. by adding or strengthening "driving" or "positive" forces (positive only in the sense that they lead towards change) and / or by reducing or eliminating "negative" forces (restraining forces that prevent change).

The relevancy of the models to the study is that each respondent has a life space, which consists of both the condition of the individual and the environment. In this regard, the adoption and non-adoption of the acquired knowledge will depend on individuals' experience, needs, goals, aspirations, objectives and other factors. The training program content might be received by respondents, depending on its relevancy to their needs and objectives, as such constituting positive forces. Consequently, as the respondents intend to take action to achieve the objectives, which are located within the environment, they encounter negative forces or obstacles that impede adoption.

Similarly, respondents depending on their needs and objectives might not receive the content of the training program. In this scenario, the negative forces are stronger than the positive forces, and automatically there will be no adoption.

As observed from the field theory, the life space of an individual is a critical factor determining behaviour change. As such it is important that the trainers from DRTC should determine and understand the life space of the trainees in order to identify the forces of adoption and non-adoption.

1.9.2 Intervening variables as intermediate behaviour determinants

Associating these forces with behaviour determinants, Tolman (1967) introduced the concept of intervening variables, which he differentiated from independent and dependent variables. The intervening variables largely make up the "intermediate behaviour space" which corresponds more or less with Lewin's "life space" of cognitive field.

As noted in Figure1.1, Düvel (1987:3) indicate that every agricultural development problem, of whatever kind, can be defined in its simplest form as being the difference between the existing and the desired situation. The existing and desired situation relates to all dependent variables namely efficiency aspects (consequences of behaviour) as well as the adoption of practices (behaviour). In each case there are two components involved, an objective and a subjective one.

The concept of intervening variables stated by Tolman (1967) indicates that mediating factors are the basic determinants in decision-making and behaviour change. The intervening variables that should be considered before conducting any training program include; needs, perception and knowledge of the farmers. If the training program can properly address the intervening variables, the

dependent variables i.e. non-adoption of the acquired knowledge and low production efficiency would be reversed.

In regard to the objective and subjective components, Düvel (1987:4) note that it is necessary to have a measurement or quantitative indications of the present objective levels of efficiency and practice adoption. The discrepancy or difference between these and the perspective desired or optimum levels, constitute the extent or scope of the different problems, which eventually need to be addressed either as a whole or on a priority basis.

1.9.3 Perception as an intervening variable

In this study, the measurement or quantitative indications of the present objective levels of efficiency and practice adoption was not determined, but the study intended to get the perception of the respondents in relation to the training program. Perception as one of the intervening variables is critical in decision-making.

According to Düvel (1987:5), *perception* in a wider sense could be understood as a process of discrimination and organization of sensory reception and the resulting organized and meaningful whole or totality of view, image, idea or concept being the result of dynamic interaction of sensory stimuli, feelings, emotions, values, attitudes, needs, motives, previous experience and knowledge.

In view of the above, aspirations, knowledge, attitudes, etc. are interwoven with perception and can be viewed as intrinsic parts of it. Perception can therefore be an excellent means of determining psychological field forces, as it indirectly comprises most if not all, the factors determining behaviour.

Berelson and Steiner (1964:88) defined perception as the more complex process by which people select, organize, and interpret sensory stimulation into a

meaningful and coherent picture of the world. Atkinson, Atkinson, Smith, and Hilgard (1985) said that perception is the process by which we organize, integrate and recognize patterns of stimuli.

The findings by Düvel (1975), supported by subsequent research, suggest that all causes of negative decision-making or non-adoption, as well as all the forces or potential forces favouring change (i.e. all forces of the psychological field) can be traced back to perception, more specifically to the perception of attributes of innovations.

The subjective component refers to the farmers, who, after all, are the only ones through whom change can be brought about. They normally perceive the existing situation differently and consequently also the urgency and extent of the different problems. This consideration is made provision for under the intervening variables, which have a direct bearing on the eventual behaviour, but are as such influenced by other personal and environmental factors.

Düvel (1975) indicated that the implied assumption is that the influence of the independent variables becomes manifested in behaviour via the intervening variables. The obvious variables on which attention therefore needs to be focused in behaviour analysis are the intervening variables. These according to extensive research by Düvel (1975), De Klerk & Düvel (1982), Marincowitz & Düvel (1987), Düvel & Scholtz (1986), etc can be broadly categorized into needs, perception and knowledge.

Mediating or intervening variables are seen as critically important determinants governing human behaviour development. Düvel (1991:78) indicated that while the problems addressed in extension or agricultural developments are normally of efficiency aspects, be they of an economic, production or practice adoption nature, the causes are ultimately of a human nature. These need to be

determined, either as part of the general survey or on a sample basis prior to the communication action.

In its simplest form the non-adoption of innovations and practices according to Düvel (1991:78) can be traced back to two basic causes: The individual is either uncapable or unwilling to adopt the recommended practice. Unwillingness to adopt can directly or indirectly be linked to a lacking need, and the related aspects of perception and knowledge. These concepts are interrelated and the differentiation between them is based on practical rather than on puristic conceptual grounds. The factors related to inability or incapability tends to be of a more independent nature and resort mainly under the broad category or personal and environmental variables.

According to Tolman (1967) the important aspects to be considered by the trainers in this study are the causes of behaviour change. The individual's unwillingness to adopt the recommended practice is a form of self-expression to show the trainers that the most fundamental aspect of need has not been addressed.

In supporting the non-adoption of innovations, Düvel's model (1991:79) indicated that a lacking, insufficient or absent aspiration as far as any aspect of agricultural development or the adoption of a specific innovation or practice is concerned, has been found to be a critical factor in numerous research studies such as Düvel (1975) and others. More specifically this relates to or is a function of the following:

- Overrating (or underrating) own efficiency
- Being unaware of possibilities or the optimum
- Being satisfied with the present situation or having a sub-optimal aspiration

In a sense the above aspects all have to do with problem perception where a problem is regarded as being the difference between what is (present situation)

and what can be or is strived at (desired situation) Figure: 1.1. If the respondents in this study have a misperception about their production efficiency, it might be difficult for them to take the appropriate decision as regard acquired knowledge.

It is in the same context, that an insufficient prominence was regarded by Düvel (1991) as one of the factors determining adoption and non-adoption of technologies. According to him prominence is synonymous with Rogers' (1983) concept of relative advantage, which he defines as the degree to which an innovation is perceived as being better than the idea it supersedes. The aspect of specifying the causes as specifically as possible led to an alteration of the concept "relative advantage" to "relative advantages" by Düvel (1991), in order to make provision for the more specific advantages and disadvantages such as economical, social, managerial, and the like. Prominence on the other hand was introduced to replace the global concept of relative advantage and is a measure of how prominent or how much more or less advantageous or attractive the innovation as a whole is relative to other alternatives. The necessity for this global comparison lies in the phenomenon that innovations are frequently perceived very positively but nevertheless not implemented, simply because another alternative is preferred (i.e. perceived to be more prominent).

Still emphasizing on the importance of prominence, Düvel (1991:81) indicated that unfavourable perception concerning the relative advantages refers to both advantages as well as disadvantages of the innovation or practice, as such the possible causes for no-adoption could thus be:

Unaware of the advantages and / or
Awareness of disadvantages

Both the advantages and disadvantages are need related in the sense that both contribute to the overall attractiveness (or unattractiveness), which can only come about in the context of a relevant need disposition. Innovation attributes such as

advantages and disadvantages in a certain need context can be accepted to constitute positive (driving) and negative (change impeding) forces. The imbalance of negative or positive forces as causes of non-adoption would then be the result of the mentioned unawareness of advantages or an awareness of disadvantages.

According to this model, the most important aspect of an innovation is its prominence compared to other alternatives. This is also true for the training program offered at Denman Rural Training Centre. After training, the respondents compare the advantages of the acquired knowledge with what they know and what they have. If the acquired knowledge is not more prominent i.e. if disadvantages according to the respondent outweigh the advantages, there will be no implementation.

In his model again, Düvel (1991:81) indicated that where as advantages and disadvantages refer to an innovation or goal-object as such, compatibility relates more to situational aspects i.e. the relevancy of the innovation in the individual's specific situation. Compatibility or incompatibility is again no unidimensional factor but can refer to a wide range of aspects such as personal, physical, economical, social, cultural etc.

The wide concept of compatibility makes *inter alia* provision for the accommodation of needs, aspirations, preferences, etc. but also refers to other practical aspects like the labour and capital situation etc.

In relation to the independent variables Düvel (1987:6) noted that the initial pre-occupation of the extension research with the causal relationship between independent variables (e.g. management aptitude, education, age, farm size, etc) and adoption behaviour is now, in the light of findings on the situation specificity of human behaviour, outmoded. Indications, supported by research findings, are

that variables in this category have only an indirect influence on decision-making and therefore on the field factors.

What this implies on the situation determination is that it is not essential to obtain information on these variables. Furthermore, this information can seldom be used in practice, because – particularly when there is a multiplicity of such variables involved – it is impossible to define audiences that are homogeneous concerning these independent variables. On the other hand, this information does give the extensionist better insight into an understanding of the farmer's actions and reactions, because he will be able to observe and understand causal relationships and will therefore be able to predict behaviour more easily. A further argument in favour of the partial inclusion of this information in situation survey is that it can be easily, simply and rapidly obtained.

Similarly, the information on independent variables of gender, age, education level, farm size and others in this study was obtained for the same reasoning, to understand how the target population was distributed and their personal characteristics.

1.9.4 Extent to (a) which farmers contribute to the development of the training **programs and (b) the criteria for selecting course participants**

In trying to explain the situation where participants are not involved in contributing to the development of programs, Hope and Timmel (1990:9) used the term "banking approach" to describe the conventional paradigm because the trainer was seen as possessing all the essential information while the learners were seen as "empty vessels" needing to be filled with knowledge.

Agricultural extension, according to Rutatora and Mattee (2001:89) over time has focused on transfer of technology that made the government to adopt systems and / or approaches to extension that have been extrapolation in donor countries

and have essentially been supply driven, top-down and manipulative. The adopted systems / approaches have never taken into consideration farmers' issues, problems, needs and their involvement. In addition, they never undertook systematic investigation of what farmers expect from extension and of the role it should play. As a consequence they ended up promoting and disseminating recommendations that were incompatible to the local circumstances.

Rutatora & Mattee (2001:91) indicated that from the very beginning extension services were offered through what has been termed the "banking" (Freire, 1970), top-down (Kauzeni, 1989), empty-cup or directive (Keregero, 1991) approach. All too often extension services have been structured and operated on the assumption that farmers are passive, ignorant, illiterate, and they are unable to improve or to integrate new farming practices into their established agricultural systems.

Since adult learners will learn best what is most relevant to them, they must be involved in the determination of their own training needs and planning of a learning management system (Clark & Timms, 2000 and Olivier, 2000: 50).

Treunicht, Steyn and Loots (2001:115) emphasized that local interest groups should identify needs themselves according to their own values and norms. The emphasis is on a collective approach to grassroots development. It is therefore a timeous process to involve sufficient people in the process of felt needs identification.

Need based development is an acceptable departure point in the methodologies of extension; where behaviour is directly focused on the goal as a means for need satisfaction. A most important function of extension will always remain the identification of needs (felt and unfelt needs) according to which development are to be planned, initiated and adapted. Such programs should involve different role players as appropriate including specialists (De Beer, 2000:63-64).

As revealed by literature, the needs of the farmers should be the basis for development of the training program. This means that, the training program can only be meaningful if farmers participate in identifying the courses they need to be trained on. It is in the same context that this study intends to determine how farmers are involved in development of the training program.

Johnson, Miller, Miller, and Summers (1987) indicated that "just as there are many different theories of the problem, different concepts of need also exist." A *normative need* is said to exist when a standard of service or living is established and certain people are found to fall short of enjoying that desirable standard. *Comparative need* is not based on a set standard but rather on the relative position or condition of a group when measured against some other group. *Felt need* is a need perceived by individuals experiencing the problem. It may be equated with want and is phenomenological in character. *Unfelt need* is a need experienced by an individual not experiencing the problem, e.g. an extension agent's view about the farmer's problem. *Expressed need* is a felt need that is articulated as a demand. It is a need put in action in the form of asking for service, protesting, signing a petition and so forth.

As indicated, there are different concepts of need; this study will try to find out which needs have been addressed in the training program. It is assumed that if farmers are not involved in the development of the training program, it is the unfelt needs that are being addressed in the training program. Even if the extension agent when developing the training program may perceive the problem correctly, it is true that what a client considers rational for him or herself is not necessarily what the change agent believes rational for the client. As such the training program may not address the felt needs.

Mwangi and Rutatora (2002:31) indicate needs assessment as the process that enables extension agents to identify and provide effective educational programs that address current needs of clients, while projecting emerging priorities, plan

forward and evaluate alternative solutions in order to make current program decisions, determine appropriate goals for various programs and solve the right problems.

Mwangi and Rutatora (2002:32) citing Baker (1987), Boyle (1981), Brakhaus (undated) and Kaufman (1983) agree that a need is a difference or a gap between what is and what should be, in terms of the outcomes of the extension programs and determining the priorities of these needs.

Democratically, a need is a change desired by the majority of some reference group (Witkin, 1984). An educational need can be satisfied by means of a learning experience (Baker, 1987), but for a change to occur, people must perceive inconsistency between themselves at present and the desired state proposed (Boyle, 1981). They must accept and recognize that a need exist. The process of identifying and analyzing educational needs-deficiencies or problems is called needs assessment. Witkin (1984) defines needs assessment as any systematic procedure for setting priorities and making decisions about programs and allocation of resources.

Mwangi and Rutatora (2002:30) agree that needs assessment is important in the process of initiating and implementing extension programs. Lack or poor needs assessment may lead to misperception or misunderstanding of client's needs, priorities, and genuine response to technical advice, which may cause program failure. Such misunderstanding if allowed to exist would be very costly to any nation in terms of wasted time and effort, persistent low yield due to inefficient production, low family incomes, poor adoption rates of extension recommendations and slow rate of economic growth and development.

1.9.5 The impact of the knowledge gained from the training program on the farming practices of the trainees

Impact according to Horton *et al* (1993:8) refers to both the short-term effects of research (like adoption of a new variety) and long-term effects (like increase in yields, production, income, and social well-fair resulting from adoption of a new variety). The study evaluated both the short-term and long-term impact of training on farmers' production efficiency. It also established how training offered has helped the farmers.

According to Richardson (1999:46) in judging public benefit, "people impact" is key factors in program accomplishments. The people impacts may be indicated as financial gains, taxpayer savings; efficiencies gained; environmental enhancements or protection; individual life enhancements; resource preserved; or societal improvements.

Impact is described in the context of what happens as a result of what we do: learning developed (attitudes, knowledge, skills); behaviour change (application of what is learned); and impacts of results on customers and general public. The critical issue according to Fremy (2000:45) is the ability and capacity of the stakeholders to transform good visions prepared in offices into actions in the field through a progressive and practical result oriented manner.

1.10 Definition of terms

Adoption is a decision to make full use of an innovation as the best course of action available; it is a process of adopting an existing idea

Behaviour is regarded as a function of the total situation, i.e. the life space or cognitive field, which consists of both the condition of the individual and the environment.

Behaviour in its simplest form can be regarded as a type of movement brought about by forces or energy resulting from a system in disequilibria.

Cognition refers to the mental processes of perception, memory, and information processing by which the individual acquires knowledge, solves problems, and plans for the future.

Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experience, and needs of potential adopters.

Dependent variables are defined as a combination of verbal, skeletal, and visceral reactions to the external stimuli.

Dependent variables are variables that are expected to change because of the manipulation of other variables.

Efficiency means producing high-quality goods in the shortest possible time.

Efficiency: how effectively resources are used to generate useful outcome.

Evaluation means judging, appraising, or determining the worth, value, or quality of proposed, on-going, or completed research or project, generally in terms of its relevance, effectiveness, efficiency, and impact.

Fatalism defined as the degree to which an individual perceives a lack of ability to control his future.

Felt need is a need perceived by individuals experiencing the problem.

Unfelt need is a need experienced by the individual not experiencing the problem, e.g. an extension agent's view about the framer's problem.

Independent variables are the initiating causes of individual's action consisting of the environment entities presented to the individual actor at a given moment.

Intervening variables are postulated explanatory entities conceived to be connected by one set of causal functions to the independent variables, on one side, and by another set of functions to the dependent variables of behaviour, on the other side.

Intervening variables regarded, as mental processes are inferred determinants of behaviour tied objectively to the ultimate causes or stimuli on one hand and to the final act, on the other.

Impact refers to both the short-term effects of research (like adoption of a new variety) and long-term effects (like increase in yields, production, incomes, and social well-fair resulting from adoption of a new variety).

Life Space (Psychological Field) consists of the person and the psychological environment, as it exists for him. It is the totality of all psychological factors that influence the individual at any given moment.

Need is defined as something you are willing to do, motivated to take a sacrifice for.

Problem perception or need tension is defined as the perceived discrepancy between the present situation and the desired situation or level of aspiration; it is the difference between "what is" (present situation) and "what can be" or is strived at (desired situation).

Prominence is a measure of how prominent or how much more or less advantageous or attractive the innovation as a whole is relative to other alternatives.

Perception in a wider sense could be understood as a process of discrimination and organization of sensory reception and the resulting organized and meaningful whole or totality of view, image, idea or concept being the result of dynamic interaction of sensory stimuli, feelings, emotions, values, attitudes, needs, motives, previous experience and knowledge.

Perception is defined as the more complex process by which people select, organize, and interpret sensory stimulation into a meaningful and coherent picture of the world.

Variable is any factor that can be expressed numerically; any property that can take on different values.

CHAPTER TWO
THEORETICAL EXPOSITION

2.1 Introduction

According to Xaba (2002:1), the issue on the development of people in the developing countries is a central and overarching concern made more problematic by the growing emphasis on a more holistic approach towards addressing the concern. Added to this, is the presence in the developing countries of the typical North-south or rich-poor dichotomy, which characterizes the international scene and has led to different development approaches such as production technology (top-down, centralized, blue print) approach and participative problem solving (bottom-up, decentralized, facilitative, process). This chapter reviews the literature on the impact of training courses on farmers' production efficiency. Since training is part of human development and very critical for adoption and non-adoption of innovations, it is important to find out what other researchers said about the impact of training.

2.2 Farmer training in Botswana

According to Montsho (2002:24), who did a study on the impact of horticultural courses at DRTC, there is very little documented on the training of farmers in Botswana. It is noted that the training centre provide mainly one-week courses on improved technologies of crop production, farm mechanization, animal production, home economics and other agricultural related activities. The training centre use demonstrations and practical lessons during farmers' courses to enhance mastering of agricultural production skills and related knowledge. According to Montsho (2002:43) out of seventy respondents interviewed, 61% were female while 39% were male. The study concluded that the majority of the farmers who attended horticultural courses at DRTC poorly apply what they have been taught in their own farm situation with respect to horticulture.

Field (2001) indicated that in the Philippines and Thailand, rural training centres are called Farmer Field Schools. In these schools farmers determine the kind of training, research and knowledge they require. Government and non-governmental organizations work closely together and where appropriate non-governmental organizations take the leading role in running the field schools. This build better working relationship and understanding of each other's working procedure.

2.3 Training impact evaluation

According to Taylor-Powell, Steel and Douglah (1996) evaluation studies are conducted largely to improve educational efforts and accountability. These writers indicated that program evaluation helps people to understand the program, improve its results, teaching and measure whether the program made a difference in peoples' lives and also determine if the program is worth the cost.

Smith (1994:14) indicated that there are four general purposes of evaluation, and these are *proving, improving, learning and controlling*. The first *proving* aims to demonstrate conclusively that something has happened as a result of training or development activities, and that this may also be linked to judgments about the value of the activity: whether the right thing was done, whether it was well done, whether it was worth the cost and so on. The second aim, *improving* implies an emphasis on trying to ensure that both the current or future programs and activities become better than they are at present. The third aim, *learning* recognizes that evaluation cannot with ease be divorced from the processes upon which it concentrates, and therefore that this slight problem might well be turned to advantage by regarding evaluation as an integral part of the learning and development process itself. The fourth aim, *controlling*, is a very common activity for evaluation and involves using evaluation data to ensure that individual trainers are performing to standard, or that subsidiary training establishments are meeting targets according to some centralling determined plan.

This study mainly focused on proving and improving purposes of evaluation. The intension was to determine whether something has happened as a result of training and to ensure that both the current and future training programs become better than they are at present.

Since agriculture is a biologically based system, it is well known that the interactions in agriculture are more complex and much less predictable than those in industrial production. This complexity as well as the variability of resources and low level of specialization compelled by diversity demand a high level of learning and thus necessitate a very high level of training (Wake, Kiker & Hilderbrand, 1988: 183).

According to Olivier (2000:126) the changing nature of work today requires much more sophisticated thinking skills, creative thinking, self-management abilities, interpersonal skills and understanding of modern technology. In addition one of the limitations of training, as a form of non-formal training, is the difficulty to implement mechanisms by which the learning progress of the learner can be effectively evaluated and monitored.

DuToit & Zwane (2001:143) realized that the training program, based on conventional principles, had to be improved, four major short comings were identified: first, the trainer centered approach at the expense of the learner; second, the gap between theory and application of knowledge; thirdly, the fragmentation of the learning process and forth, the lack of a proper assessment system. In order to overcome these shortcomings the following perspectives are now considered.

The gap between theory and practical application; an opportunity for learners to practice what they learn and to experience a feeling of accomplishment must be provided (Clark & Timms, 2000:23).

According to Fremy (2000:44) it is a priority to train participants not in classrooms but on site, on how to work more efficiently where they are with what they have. Learners must be enabled to integrate, synthesize and apply a complete array of content and competence, often in the face of demanding realities and challenges that they may encounter in the real situation.

The aim according to Bender (2001:4) is to extend the world of learning into a lifelong learning experience, therefore the learner must be encouraged to focus on the end results of his learning and not on that of the short-term training program, and by doing that avoiding fragmentation of the learning process.

Olivier (2000:44) indicated that proper and effective assessment system must be implemented that will continuously determine, amongst other, the extent to which the objectives of learning program has been achieved, the applicability of the leaning experience as well as all aspects of facilitation and support provided to the learners.

In search for new directions and more effective training strategies it became clear from Olivier (2000:29) that the outcomes-based learning approach represent the new learning culture. It also became apparent that the approach not only represents a new paradigm but also addresses those shortcomings to conventional training that was clearly identified in the extension-training program. The bases of the outcomes-based concept is that learning is based on achieving an end-product and whatever is learned takes place within the context of the out-come.

Learning according to Bembridge (1991:47) when related to adults can be defined as the acquisition of information and mastering of that intellectual behaviour through which facts, ideas or concepts are manipulated, related and made available for use. Learning is a personal process in terms of the learner's own needs and interests. The learner reacts to a message, and the learning

causes a change in behaviour, including attitudes and skills, be it mental, emotional or physical. In terms of agricultural extension, learning is the process by which people acquire new knowledge, which helps them to improve their level of farming and living standards. Teaching is the art of changing people's behaviour by facilitating the learning for them.

Bembridge (1991:47) indicated that adult learning takes place in the natural community setting, as well as in the formal instructional setting, such as a farmer-training center. Systematic learning occurs in the formal setting as a result of the farmer's participation in a specific training course or learning experience in which certain instruction methods and techniques are used by the trainer or extension worker to achieve certain results. Adult education in the extension context is a formal relationship between the trainer and / or extension worker and a group of farmers directed at systematically achieving specific learning objectives. The introduction of change requires very effective training.

According to Bembridge (1991:48), people learn only what they want to learn. It follows that anything taught to farmers must be seen to satisfy need, whether real or imagined. Most adult learning is by seeing (eighty-three percent), followed by hearing (eleven percent) and other senses (six percent). The many ways in which a person acts come from one of two possible sources: either they are inherited or they are learnt. Inherited behaviour patterns are more or less fixed and almost impossible to change. On the other hand, further learning can in principle modify anything that has been learnt. Learnt behaviour can be divided into the categories of knowledge, skills and attitudes.

Bembridge (1991:49) continues to indicate that adult learning focuses on the problems of the present. The solution must come from or be congruent with, the learner's experience, expectations and potential resources, rather than be prescribed by an expert. Adults are more likely to remember a solution they have worked out for themselves rather than one which has been given to them by the

trainer. They also are more likely to act on decisions made by themselves rather than those made by the trainer. Learning will take place more quickly if participants perceive the need for, and are ready to learn about, a particular farming enterprise or practice. In general, people learn best when they actually do the job, next best from what they see, and then from what they hear and read. Lecturing is an ineffectual way of teaching adults, but can be made more effective if used in conjunction with other techniques such as role-play, models, demonstrations and field trips.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter outlines the methodology used in evaluation of the impact of training on farmers' production efficiency with special reference to Denman Rural Training Centre in Gaborone Region. The description of the study area, questionnaires design, sampling procedure, survey, types of respondents and data analysis has been discussed.

3.2 Description of the study area

The problem of the poor impact of training on farmers' production efficiency is a national one, experienced at all five rural training centres in Botswana, but due to limited resources of manpower, funds and time the study focused only on one rural training centre. The study was conducted at DRTC, which is located in Gaborone Agricultural Region in the southern part of the country. Gaborone region consists of five districts being Kgatleng, Southeast also known as Bamalete/Tlokweng, Kweneng south, Kweneng north and Kweneng west. The location of the study area in the country is shown in Figure 3.1: Map of Botswana, and the study area Figure 3.2. The reason why Gaborone region was chosen is that it has both the hard and sand veld with different geographical conditions, which are faced by farmers. The researcher is more familiar to the region and could work better with the staff, as well as its proximity to the Ministry of Agriculture where assistance was sought.

DISTRICTS BOUNDARIES

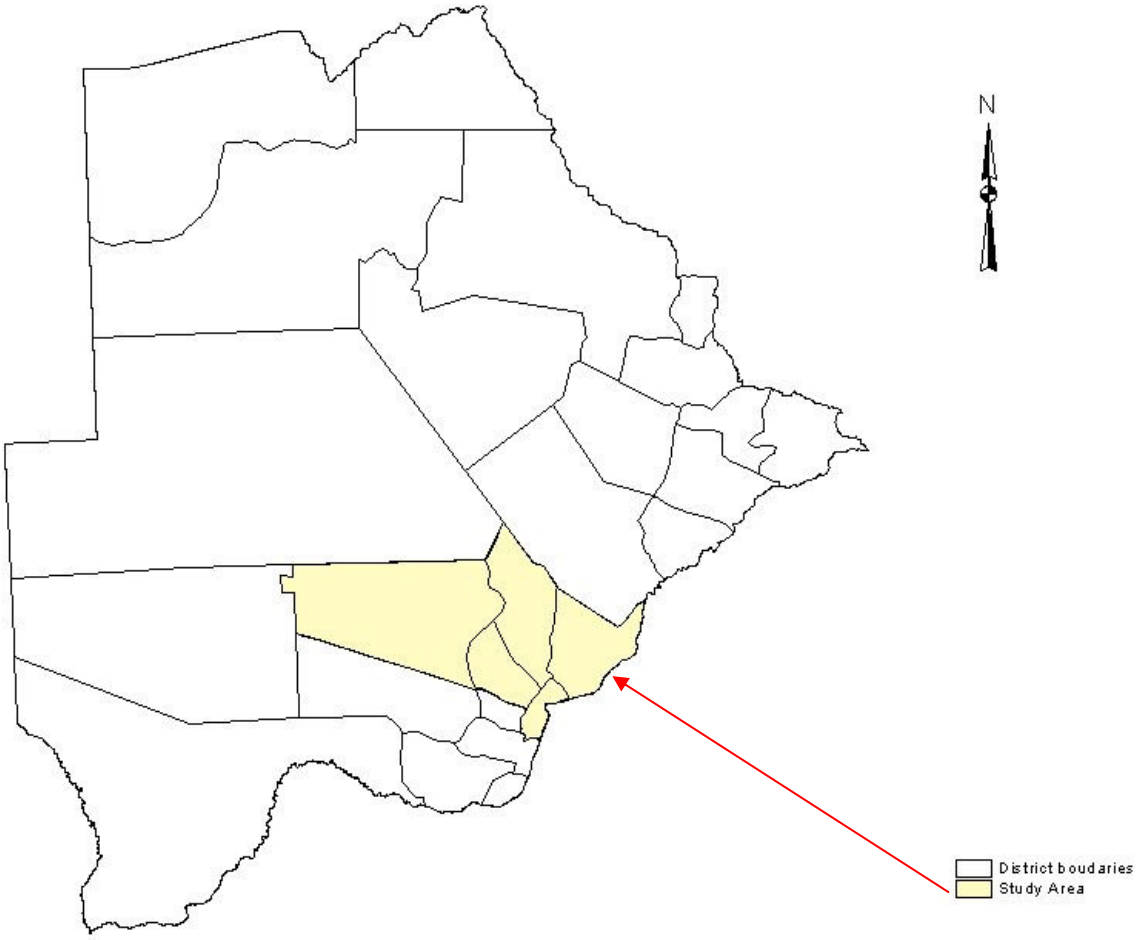


FIGURE 3.1: MAP OF BOTSWANA INDICATING THE RESEARCH STUDY AREA

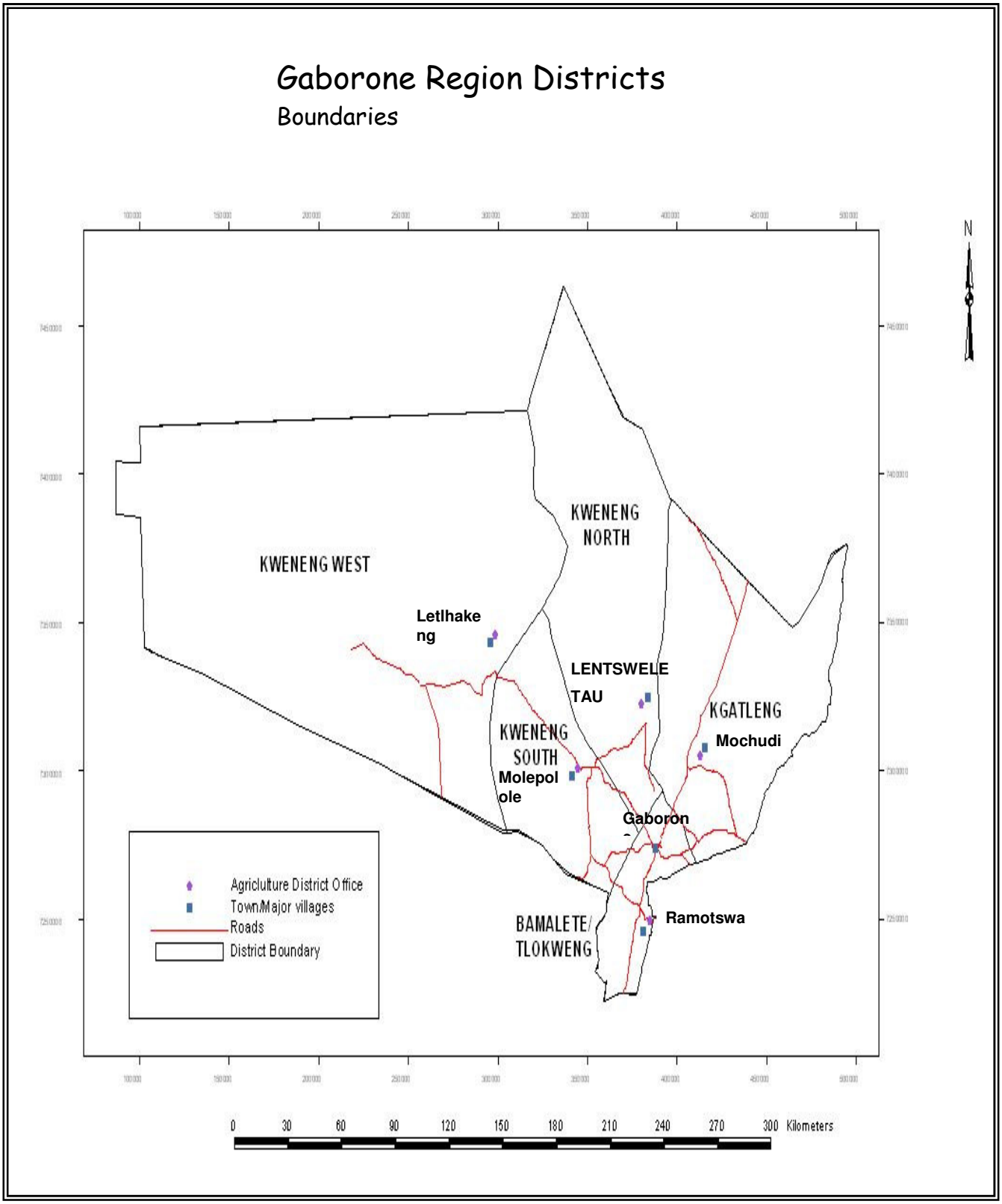


Figure: 3.2 Districts of Gaborone Region Research Study Area

Generally the climate of Gaborone region is warm and dry with strong winds from August to October. The rainy season is between October and April with an average rainfall of 450 – 500mm (FAO project, 1971). Rainfall in the region is mainly erratic in its distribution. The drought spell, which varies in both the length and extent of severity, is a common feature in the region. The soils in Kgatleng district follow a pattern of the underlying rock types. Thus the largest area has sandy soils, which are coarse and infertile in the northwest. To the southeast, the soils are more mixed with areas of red-brown loamy soil and patches of grayish-black clay, which are more fertile.

The soils in the three districts of Kweneng i.e. south, north and west also follow a pattern of the underlying rock types. The largest area has sandy soils, which are coarse and infertile in the northwest. To the southeast, the soils are more mixed with areas of red-brown loamy soils and patches of gray black clay, which are more fertile. Southeast (Bamalete/Tlokweng) district falls within the hard veld, and it has the best soils in the region, (Refer to Figure 3.1 and 3.2 for more details).

3.3 The research design

The survey research design was used in this study. The design was selected to survey a sampled number of farmers who attended training at DRTC from the years 2001/2002 – 2002/2003, and those who never attended any course. A number of frontline extension agents, support staff, instructors and managers were also surveyed. This design was selected because it produces data that is representative and also helps the researcher to describe the situation as it is at that particular moment.

3.4 Data collection

A questionnaire design technique was used to collect data. Six questionnaires were constructed, i.e. for trained farmers; control group (farmers never trained), frontline extension agents, support staff, instructors and managers. Questionnaires for farmers and staff had similar questions but also differed in certain aspects.

The frontline extension agents are officers based at village level, to assist farmers on a daily basis. They all have a certificate in general agriculture. At this level they cover all aspects of crop production, e.g. horticulture, beekeeping, soil conservation, soil survey, agronomy, 4-B youth movement, irrigation etc. They link farmers with government through the district agricultural office. Their job description includes the following:

(i) To conduct crop demonstrations such as plant population, row planting versus broadcasting etc.

(ii) To facilitate training of farmers. They are supposed to consult farmers and identify farmers' needs in relation to training and then submit the needs to the district office.

(iii) To promote diversification of agricultural products. They encourage farmers to diversify, e.g. fodder and groundnuts production etc.

(iv) To facilitate establishment of projects, if the farmer intends to start a project he/she goes through the frontline extension agent.

(v) To facilitate formation of farmers' organizations, this is the committee, which the extension agent should work with.

Most of the support staff officers are at the regional level, while some are at the district level. They are specialists in different fields with a diploma and / or degree in agriculture. They perform all the mentioned tasks for frontline extension agents at a higher level. They support the district agricultural office and assist the farmers through the frontline extension agents depending on their specialization. The instructors are based at DRTC, and they teach / train all farmers within the region. The principal for DRTC coordinates all training activities at the centre, while the district agricultural officer / manager plans, organize, direct and coordinate agricultural activities at the district level.

In sourcing out information from respondents, the following types of questions were used:

- *Factual questions* were employed to obtain background information mostly on farmers (for example, level of education, number of years in farming etc).
- *Multi-coded questions* such as "which criteria do you use to identify courses for the farmers", allowing several responses to try and establish whether there was any one dominant method used by staff.
- *Scaling questions* employing a whole battery of questions with forced choice responses such as "evaluate to what extent did the courses you attended, meet your expectations" on a scale of 1 – 10 i.e. one being *not at all* and ten *to a great extent.*

- *Opinion and attitude questions* such as “do you think training of farmers is important”, to get the views of respondents as regard training.
- *Open-ended questions* such as “what are usually the reasons for non-adoption of technologies by farmers”, were asked to try and gain insight of the general views of the respondents.

(For details refer to Appendix A-F the questionnaires)

The following steps were done to ensure that the data collected was as reliable as possible:

(i) *Obtaining trust and co-operation*

A challenge for a large organization is to build a shared vision where officials at all levels are of the outmost importance both for the success of the research itself and the implementation of the research thereafter. The researcher solicited support from the chief agricultural scientific officer (extension) who later wrote a letter to the Regional Agricultural Officer Gaborone region informing him about the research project. The Regional Agricultural Officer was requested to give maximum support during data collection and also to inform his district managers and extension agents to fully cooperate and support the researcher.

(ii) *Selection and training of interviewers*

Four District Agricultural Supervisors and one District Crop Production Officer were selected to assist in data collection. They were trained for a day on the following:

(a) Background and purpose of the study
(b) Sampling procedures
(c) Interviewing procedures and techniques to be used

(d) Filling and editing the record form

(e) Translating the questions to Setswana and how to ask them

Data was collected over a period of three months i.e. from February – April 2005.

Personal interview schedules were used to collect data from farmers. The five trained officers; one per district and the researcher who was the coordinator or supervisor visited farmers at their fields/homes and interviewed them. This method was used because of the following reasons:

(i) It provides the most direct evidence of face-to-face interaction with the respondents.
(ii) It yields a high percentage of returns, as most people are willing to cooperate.
(iii) The interviewer has an opportunity to explain the questions to respondent.
(iv) Complete answers to all questions can usually be obtained, this contribute to statistical accuracy, validity and reliability.

Then the researcher attended regional and district meetings, where explanation of the research project was done, and then questionnaires were distributed to the staff to fill, and after some days they were returned. The distributed questionnaire costs less and it's easy to administer.

3.5 Sampling procedure

A record of trained farmers since 2001 – 2003 was procured from Denman Rural Training Centre and a list of names including courses attended were compiled. The population was 800 names of farmers. Systematic sampling was used to sample twenty percent of this population. Systematic sampling was used

because it is generally quick, easy and more convenient. Using this sample method, it was found that 20 percent of 800 is 160 which was the sample size or number of farmers to be interviewed, i.e. N = 800, n = 160, then the interval length or the integer k was calculated which was 5, this means that every fifth name on the list was picked to be in the sample. The sample population was from the five districts, which forms Gaborone region.

The five districts of Gaborone region were requested to submit names of farmers who have never been trained to treat them as a control group. Only two districts of Kgatleng and Southeast managed to identify farmers who have never been trained, twenty-one names were submitted and all the farmers were interviewed. All the frontline extension agents, support staff, and instructors in Gaborone region were interviewed, except for managers where only two out of six did return the questionnaires.

3.6 Population of the study area

From the target population of 160 trained farmers, the researcher managed to interview 153 only. The reasons for discrepancy were that some of the farmers have passed away, some relocated to other areas and some could not be located. A control group of twenty-one farmers who have never been trained were interviewed. Amongst the staff, thirty-three frontline extension agents were interviewed; nine support staff; five instructors at Denman Rural Training Centre and two managers.

3.7 Data analysis

Data was captured in Excel and later imported to Statistical Package for the Social Sciences (SPSS version 13) for analysis. Before analysis, data was put into a computer readable format, which involved coding i.e. making sure that numbers are assigned to each variable, editing and checking the questionnaire.

Two measurements scales were used i.e. nominal and ordinal. Nominal and ordinal scale measurements were used because they are more appropriate for analysis of independent and intervening variables. Descriptive statistics was used to run tables, frequency, percentage, mean and standard deviation. The scales of measurements were used to determine the linear relationship between variables, and also to make inferences to the population. The statistical tests used for analysis were Fisher's exact test and the Pearson chi-squire to test significance of the difference between two or more variables.

The Fisher's exact test is computed when a table that does not result from missing rows or column in a larger table has a cell with an expected frequency of less than 5, if the data set is small, or tables are sparse or unbalanced. It provides a means for obtaining accurate results when data fail to meet any of the underlying assumptions necessary for reliable results using the standard asymptotic method. Exact test enable you to obtain an accurate significance level without relying on assumptions that might not be met by data. The exact significance is always reliable, regardless of the size, distribution, sparseness, or balance of the data.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter present the results of data collected in Gaborone region. The data results are presented per specific objective, as described in chapter one of the study. The data on some of the respondents in this study is so small that the Asymptotic Method cannot be used to analyze it. As such the Fisher's Exact Test was used.

Due to limited space in tables and figures, the word Agents was used to represent extension agents, and the word Support for support staff.

4.2 Demographic information

Data was collected from 223 respondents, from these respondents 153 attended training at Denman Rural Training Centre (DRTC) during 2001 – 2003, twenty-one respondents were never trained, thirty-three were frontline extension agents, nine support staff, five instructors and two managers. The 21 respondents came from two districts only i.e. Kgatleng and Southeast. The 33 frontline extension agents as well as the nine support staff were from the five districts of Gaborone region. The five instructors were from DRTC. The two managers include the principal DRTC and one district agricultural officer.

The study considered only the personal characteristics of farmer respondents and not those of the extension staff. The personal and socio-economic characteristics or independent variables which were considered include the following: gender, age, education level, farming experience, farm size, field ownership and membership to any farmer organization. These variables were

considered to get better insight of the respondents involved in the study, and also to determine the influence of these variables on the dependent variables.

4.2.1 Sample Distribution

The distribution of the sample population in the five districts is indicated in Table 4.1, with Kgatleng having the highest at 36 percent and Kweneng west with the lowest, 11 percent respondents.

Table 4.1: Distribution of trained respondents per district

Name of District	**Frequency** (N)	**Percent** (%)
Kgatleng	55	36
Southeast	21	14
Kweneng south	32	21
Kweneng north	28	18
Kweneng west	17	11
Total (N)	153	100

4.3 Factors that could influence the implementation of agricultural technologies

A. Independent variables

4.3.1 Gender

One of the topical constructs on national and international discourse at present is gender. As such, it is imperative for this study to determine the composition of respondents based on gender. This will assist decision makers in formulating gender-sensitive agricultural policies and programs. As an independent variable, gender was considered in this study and the analysis indicated that of the 153 trained respondents 39 percent of them were male, and 61 percent were female.

A similar pattern was observed from the control group, of the 21 farmers interviewed, 24 percent were male, and 76 percent were female. This shows that the majority of the respondents in the study are female.

4.3.2 Age

The respondents were grouped into four age groups namely: <=35, 36-50, 51-65, and >65 years of age. Trained farmers and control group's age were correlated with gender to determine any relationship. The age distribution of respondents ranged from 20 to 84 years. The majority (29 percent) of trained respondents are within the 51 to 65 age group, and 26 percent are over 65 years of age. A similar pattern was observed in the control group, where 48 percent were within 51 to 65 years and 24 percent above 65 years age group. Table 4.2 below shows respondents' age groups according to gender**.**

Table 4.2: Cross tabulation of male & female respondents according to age categories

Age Categories	**Gender**				**Total**		**X^2**	
	Male		Female					
Trained Respondents	n	%	n	%	n	%	value	p
<=35	9	16.1	18	20	27	19	8.110	0.044
36-50	12	21.4	26	29	38	26		
51-65	13	23.2	29	33	42	29		
>65	22	39.3	16	18	38	26		
Total	56	100	89	100	145	100		
							Fisher's exact test	
Control Group	n	%	n	%	n	%	value	p
<=35	0	0	1	6	1	5	.959	1.000
36-50	1	20	4	25	5	23		
51-65	3	60	7	44	10	48		
>65	1	20	4	25	5	24		
Total	5	100	16	100	21	100		

Table 4.2 indicates that the number of trained female respondents is significantly higher than the male in all but one age category. For the >65 years age group, percentage males were significantly higher than females. Majority of females fall within the age groups 36-50 years (29 percent) and 51-65 years (33 percent) as compared to 39.3 percent of male respondents who are over 65 years of age. These results according to Pearson chi-square (x^2 = 8.110, p = 0.044) show a significant association between gender and age categories. Based on this finding, we can conclude that female respondents are significantly younger than their male counterparts, who are mostly above pensionable age.

In the control group, the number of female respondents is higher than males in all categories. A key observation in this analysis is that 25 percent of female respondents in the control group are over 65 years of age, as compared to less than 20 percent (18%) of female trained respondents. Fisher's exact test shows no significant relationship between gender and age categories.

4.3.3 Education level

One of the critical attributes to knowledge and information assimilation is education. In this study education is regarded as an important construct, which can assist farmers in decision-making. The information in Table 4.3 indicates the association between education levels of trained and control group respondents with gender.

Table 4.3: A distribution of male and female respondents according to education levels

Education level	Gender				Total		X^2	
	Male		Female					
Trained Respondents	n	%	n	%	n	%	value	p
No education	38	64	21	22	59	39	27.975	0.000
Sub A – Sub B	3	5	7	8	10	6		
Standard 1 – 7	13	22	46	49	59	39		
Form 1 – 3	3	5	16	17	19	12		
Form 4 - 5	2	4	4	4	6	4		
Total	59	100	94	100	153	100		
Control Group							**Fisher's exact test**	
	n	%	n	%	n	%	value	p
No education	4	80	2	13	6	28	7.499	0.011
Sub A – Sub B	0	0	1	6	1	5		
Standard 1 – 7	1	20	13	81	14	67		
Form 1 - 3	0	0	0	0	0	0		
Form 4 - 5	0	0	0	0	0	0		
Total	5	100	16	100	21	100		

The above results reveal that there is a significant relationship between gender and level of education (x^2 = 27.975, p = 0.000) within the trained group. Of the 153 trained respondents 39 percent had no education; while 28 percent of the control group reported likewise. There is a substantial difference between male and female respondents; over three quarters (78 percent) of trained female respondents are literate, while only 36 percent of males are. This is an indication that significantly more females are literate than males.

The same pattern was observed within the control group, where 80 percent of the males are illiterate against 13 percent of the females.

4.3.4 Farming experience

Farming experience, as an aspect of an individual's acquired skill, is critical in decision-making. No relationship was found between farming experience and gender of trained respondents and the control group.

The results indicated that 78 percent of the male and 84 percent of the female trained respondents have been farming for more than ten years. Similar results for the control group were observed where 80 percent male and 94 percent female have been farming for more than ten years.
An illustration of respondents' farming experience within the two groups is shown in Figure 4.1.

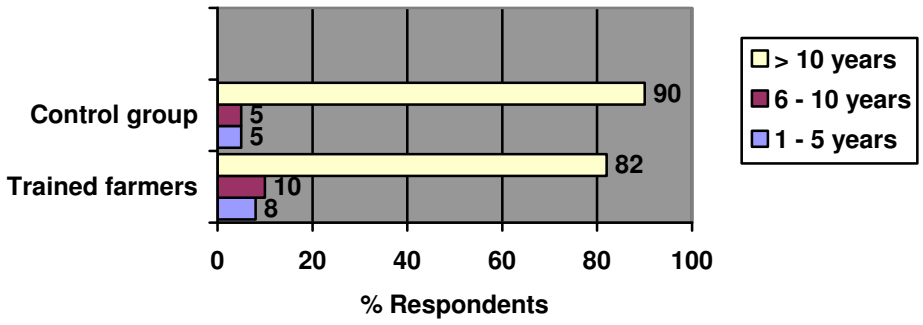


Figure 4.1: Farming experience of trained farmers and control group

In total 82 percent of trained respondents and 90 percent of the control group have more than ten years of farming experience.

4.3.5 Field size

The study intended to find out if there was any relationship between field size in hectares and gender. No significant relationship was found between field size and gender within the trained as well as within the control group.

The trained respondents' field size ranged from 2 to 88 hectares (ha), with a mean of 11 ha, (standard deviation of 10.421). The majority, 72 percent have between 2 to 10 ha of land, and only 28 percent had more than 10 ha. On the other hand, the field size for the control group ranged between 1 to 18 ha, with a mean of 9 ha, (standard deviation of 5.154). Thirty-three percent have between 1 to 5 hectares, 29 percent between 6 to 10 ha and 38 percent more than 10 ha.

The results of trained respondents show that 39 percent male and 34 percent female had five hectares of land or less (<=5). Twenty-eight percent male and 42 percent female had 6 to10 ha of land, while 33 percent male and 24 percent female had more than 10 ha of land. The Pearson chi-square test results (x^2 = 2.828, p = 0.243) did not show any significant difference between male and female respondents with regard to field size.

In the control group it was observed that 60 percent male and 25 percent female had five hectares of land or less (<=5). Twenty percent male and 31 percent female had 6 to10 ha, while 20 percent male and 44 percent female had more than 10 ha of land. The Fisher's exact test (f =1.954, p = 0.443) also indicated no difference.

4.3.6 Field ownership

The issue of land ownership is crucial in most of the third world countries, including Botswana. The farmer, who owns the land, can practice any farming operation freely, as compared to the one who rent it. To determine field ownership, the study asked the respondents the question "**Do you own this field?**" Land ownership in Botswana according to the results is not an issue. Most of the participants, 89 percent of trained respondents and 95 percent of the control group do own the land, while 12 percent of trained respondents and five percent of control group did not own land. The respondents who did not own land were

using the fields of their parents. None of the respondents indicated renting the land.

4.3.6.1 Gender and field ownership

This question "**Do you own this field**?" was correlated with gender of both trained and control group respondents. And the results indicated that 93 percent male and 86 percent female respondents of the trained group do own land, while seven percent male and 14 percent female do not own the land. The results of Pearson chi-square (x^2 = 1.605, p = 0.205) did not indicate any significant relationship between land ownership and gender.

The analysis on the control group indicated the same result namely that all male (100%) and 94 percent female do own the land. No significance relationship according to Fisher's exact test (p = 1.000) was found.

4.3.6.2 Age and field ownership

The information on the question "**Do you own this field**" correlated with age is illustrated in Table 4.4 below.

Table 4.4: Distribution of field ownership according to age categories

Trained Respondents	**Resp**	**Age Categories**								**Total**		**Fisher's exact test**	
Variable		<=35		36-50		51-65		>65					
Do you own this field		n	%	n	%	n	%	n	%	n	%	value	p
	Yes	7	47	33	89	41	98	36	97	117	89	22	0.000
	No	8	53	4	11	1	2	1	3	14	11		
Total		15	100	37	100	42	100	37	100	131	100		
Control Group		n	%	n	%	n	%	n	%	n	%	value	p
Do you own this field	Yes	0	0	5	100	10	100	5	100	20	95	7.3	0.048
	No	1	100	0	0	0	0	0	0	1	5		
Total		1	100	5	100	10	100	5	100	21	100		

The results show that 89 percent of the trained respondents own land. The majority of these respondents fall within the range of 51 to over 65 years of age, as indicated by 98 percent and 97 percent, respectively. On the other hand, 53 percent of respondents <=35 years of age do not own land. The above table shows a significant relationship between age and landownership within the trained respondents. The number of respondents owning the land increases from 7 in the youngest age group to 36 in the oldest age group (>65). While the number of respondents not owning land decline from 8 in the age group <= 35 to only one in the age group >65 years.

The control group also shows similar results, with the Fisher's exact test indicating a significant relationship (f = 7.378, p = 0.048), the older the respondents the more they own land.

4.3.7 Organization membership

Membership to an organization provides a valuable learning and collective bargaining opportunity for farmers. To gain insights about respondents' membership status, the study asked respondents the following question, "**Are you a member of any farmer organization**?" Response to this question was then correlated with gender and age for both trained respondents and the control group.

Most of the trained respondents 54 percent are members of farmer organizations as compared to only 10 percent of the control group, while 46 percent of trained respondents are not members of farmer organization as compared to 90 percent of the control group. This is an indication that trained respondents participate more in farmer organizations than the untrained ones.

4.3.7.1 Gender and organization membership

The question of membership to any farmer organization and the relationship with gender were determined for trained respondents and the control group. The analysis showed that 49 percent of the male respondents and 57 percent of the female respondents for trained group are members of farmer organizations, while none of the male and only 13 percent female respondents in the control group are members of farmer organization.

The results of Pearson chi-squire for trained respondents as well as for the control group did not indicate any significant association. There is however an indication that female respondents participate slightly more in farmer organizations than the male respondents.

4.3.7.2 Age and organization membership

In a similar manner, the relationship of membership to any farmer organization with age groups of both trained respondents and control group were determined. The results are shown in Table 4.5.

Table 4.5: Respondents' membership to farmer organization according to age

Trained Respondents	**Resp**	**Age Groups**								**Total**		**X^2**	
Variable		<=35		36-50		51-65		>65					
Are you a member of any farmer organization		n	%	n	%	n	%	n	%	n	%	value	p
	Yes	5	19	23	62	29	69	21	55	78	55	17.5	0.001
	No	21	81	14	38	13	31	17	45	65	45		
Total		26	100	37	100	42	100	38	100	143	100		
Control Group												**Fisher's**	
		n	%	n	%	n	%	n	%	n	%	value	p
Are you a member of any farmer organization	Yes	0	0	1	20	0	0	1	20	2	9	3.6	0.310
	No	1	100	4	80	10	100	4	80	19	91		
Total		1	100	5	100	10	100	5	100	21	100		

The results of the Pearson chi-square (x^2 = 17.515, p = 0.001) in trained respondents show that there is a significance association between organization membership and age. According to the above table, the number of trained respondents who are members of an organization increases linearly from five in the age group <=35 to 29 in the age group 51 – 65 years, and then show a slight decrease in numbers to 21 in the age group >65. Those respondents who do not belong to an organization show a linear decrease in number from the youngest age group to the oldest age group. This concludes that membership to an organization increases as respondents became older.

The results of the control group however show no relationship between organization membership and age categories.

B. **Intervening variables, behaviour and consequences**

The study considered the intervening variables namely needs, perception and knowledge, and their effect on the dependent variables, which include behaviour and consequences of behaviour.

(i) Farmers' ability to apply knowledge post-training

The study wanted to find out the intention of the farmers after training and they were asked the question **"To what extent were you determined to try out ideas presented during the course?"** The respondents were given three options, the results of which are indicated in Figure 4.2.

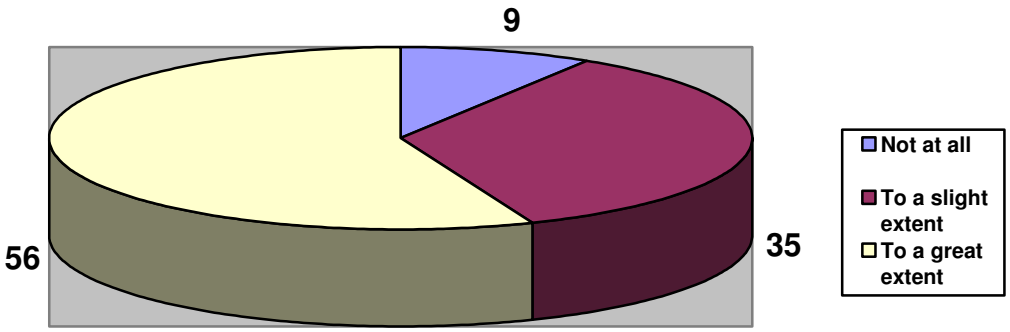


Figure 4.2: The implementation of acquired knowledge indicated as percentage.

Most of the respondents, namely 56 percent indicated that they were to a great extent determined to try out ideas after training. This concludes that respondents had interest in the courses offered.

In Table 4.6 is a list of practices implemented by the trained respondents as well as the reasons why they did not implement the acquired knowledge.

Table 4.6: Implementation status of acquired knowledge by trained respondents and reasons for non-adoption

Practices Implemented	Frequency			Percent
	N	Male	Female	
Fence construction	22	22	-	14.37
Vegetable production	19	4	15	12.4
Row planting	13	3	10	8.49
Use and care of implements	8	4	4	5.2
Role of committee members	8	2	6	5.2
Food processing	6	1	5	3.9
Pests control	4	-	4	2.3
Plough across the slope	3	1	2	1.96
Crop rotation	3	2	1	1.96
Apply kraal manure	3	1	2	1.96
Planting cash crops	2	-	2	1.3
Crop marketing	2	-	2	1.3
Record keeping	1	-	1	0.65
Sub-total	**94**	**40**	**54**	**61**
Problems hindering implementation by trained respondents				
Reasons	**Frequency**			**Percent**
Did not attempt completely	33			22
Lack of resources	20			13
Social commitments	4			2.6
Old age	1			0.65
Shortage of rainfall	1			0.65
Sub-total	**59**			**39**
Total	**153**			**100**

Out of the 153 trained respondents, only 94 (61%) indicated that they have implemented the acquired knowledge. Twenty-two (14.37%) male respondents are doing fence construction, mostly as hired labourers. Nineteen (12.4 percent) are producing vegetables. Out of this nineteen, four (21 percent) are male, while fifteen (79 percent) are female. Thirteen (8.5 percent) respondents do practice planting, out of these, three (23 percent) are male, and ten (77 percent) are

female. Sixty-one percent of respondents are implementing the practices, while in Figure 4.2 only 56 percent of the respondents intended to implement. Similarly, 39 percent of respondents are not implementing due to various reasons, while in Figure 4.2 only 9 percent indicated not to implement at all. A total of 54 females against 40 males did implement the practices and therefore we can conclude that females more readily adopted the technologies than their male counterparts.

(ii) Reasons why farmers fail to apply knowledge post-training

The results of Table 4.6 show that 13 percent of the trained respondents are not implementing the acquired knowledge because they do not have sufficient resources. These resources include funds, shortage of labour, water, draft power and farming implements. The resources mentioned here do also affect even those farmers who are trying to implement. The social and household commitments indicated by 2.6 percent of the farmers include breastfeeding, working and other reasons.

Düvel (1991:79) indicated that a lacking, insufficient or absent aspiration as far as any aspect of agricultural development or the adoption of a specific innovation or practice is concerned, has been found to be a critical factor in numerous research studies. More specifically this relates to or is a function of the following:

- Overrating (or underrating) own efficiency.
- Being unaware of possibilities or the optimum.
- Being satisfied with the present situation or having a sub-optimal aspiration.

One of the intervening variables identified by Düvel (1991) and regarded to be one of the principal causal factors among the intervening variables in behaviour determination is the perceived current efficiency (see Figure: 1.1), which can refer to the overall production efficiency or to the technology or practice adoption.

Since this aspect or variable is one dimension of the total problem of perception, it is expected to have a significant influence on adoption behaviour. As the concept implies, it is the individual's perception of the current efficiency.

The adoption and non-adoption of the acquired knowledge by respondents, as indicated in Table 4.6 could be because of overrating or underrating their production efficiency and as such be motivated / not motivated to use the new knowledge. The results indicated that few male respondents are producing vegetables and row planting; this may be due to overrating their production efficiency. The implication is that, they may not be aware of the possible results if they implement the acquired knowledge, or their perception at present is that they are satisfied with what they produce, hence see no need to adopt.

On the other hand, female respondents might be underrating their level of production, as such being motivated to implement the knowledge to improve their production efficiency.

Düvel (1975:8) indicated that perception is a key dimension in the process of behaviour change, meaning all causes of negative decision making as well as all the forces or potential forces of change, can be directly traced back to perception or the psychological field.

4.3.8 Farmers' perception of themselves and their aspiration according to different farmer categories

The farmers' current perception of themselves according to three possible farmer categories, as well as their aspiration as where do they see themselves in five years time, are presented in Table 4.7.

Table 4.7: Respondents' current perception and their aspiration in five years time

Farmers current perception	Trained Respondents		Control Group	
	N	%	N	%
Subsistence farmer	122	85	19	90
Emerging farmer	15	10	2	10
Commercial farmer	7	5	0	0
Total	144	100	21	100
Farmers aspirations in five years time	N	%	N	%
Subsistence farmer	65	45	16	76
Emerging farmer	29	20	4	19
Commercial farmer	50	35	1	5
Total	144	100	21	100

The results in Table 4.7 above indicate that 85 percent of the trained respondents and 90 percent of the control group consider themselves as subsistence farmers. Only five percent of the trained respondents considered themselves as commercial farmers, while none of the control group has that perception.

According to the above table a total of 40 percent of the trained respondents who perceived themselves as subsistence farmers indicated that they aspire to be on a higher level of farming in five years time, while only 14 percent of the respondents in the control group who perceived themselves as subsistence farmers indicated that they aspire to be on a higher level of farming.

This difference in aspiration could be because of trained respondents' exposure to training programs, while the control group were not exposed and never received new technologies to stimulate their aspirations to improve their farming operations.

4.3.8.1 Respondents' current perception and future aspirations based on gender

The analysis show that 84 percent male and 85 percent female respondents within the trained group consider themselves as subsistence farmers, while only four percent of male and six percent female regard themselves as commercial farmers. The results of Fisher's exact test (f = .725, p = 0.710) did not indicate any significant relationship.

The control group on the other hand has 21 percent male and 79 percent female respondents who consider themselves as subsistence farmers, while 50 percent male and 50 percent female respondents are emerging farmers and no commercial farmer. The Fisher's exact test (p = 0.429) did not show any significant relationship. The conclusion of these results is that there is no relationship between farmer categories and gender. This finding has been confirmed by Fisher's exact test, which shows no significant relationship.

After five years time, the results of farmer categories indicate that 43 percent male and 47 percent female respondents of trained respondents consider themselves as subsistence farmers. Twenty-three percent male and 18 percent female perceived themselves as emerging, and 34 percent male and 35 percent female as commercial farmers. The results of Pearson chi-squire (x^2 = .553, p = 0.759) did not show any significant relationship. This concludes that gender has no effect on respondents' perception regarding farmer categories.

The information on control group shows that 60 percent male and 81 percent female respondents are subsistence farmers. Fourty percent male and 13 percent female are emerging farmers, while none of male respondents and six percent female are commercial farmers. The Fisher's exact test (f = 2.226, p = 0.428) did not show any significant relationship. The conclusion is similar to

trained respondents; gender has no effect on respondents' perception regarding farmer categories.

4.3.8.2 Age based farmers' perception

Table 4.8 below shows the relationship between age and farmers' perception

Table 4.8: Respondents' current perception based on age

Trained Respondents												
Farmers perception	**Age Groups**								**Total**		**Fisher's exact test**	
	<=35		36 - 50		51 - 65		>65					
	n	%	n	%	n	%	n	%	n	%	value	p
Subsistence	14	70	30	83	39	93	32	84	115	85	13.5	0.014
Emerging	5	25	1	3	3	7	5	13	14	10		
Commercial	1	5	5	14	0	0	1	3	7	5		
Total	20	100	36	100	42	100	38	100	136	100		
Control Group												
Subsistence	1	100	4	80	9	90	5	100	19	91	2.2	1.000
Emerging	0	0	1	20	1	10	0	0	2	10		
Commercial	0	0	0	0	0	0	0	0	0	0		
Total	1	100	5	100	10	100	5	100	21	100		

Table 4.8 indicates that the majority of respondents (85%) in all age groups consider themselves as subsistence farmers, with 93 percent falling within the range 51-65 years of age. Only 14 percent of the range 36-50 years of age considers themselves as commercial farmers. The Fisher's exact results was significant (exact test = 13.552, p = 0.014) for trained respondents, while the Fisher's exact results (exact test = 2.234, p = 1.000) for the control group did not show any significant difference. For trained respondents, the significant difference indicates that 27% of younger respondents perceived themselves as emerging and commercial farmers. While only 13% older respondents perceived themselves in the same farmer categories. This is inconsistent with the wide spread opinion that young people are not interested in agricultural activities. In contrast, on the control group, age does not influence farmer's perception.

These results are supported by others in literature. Gorfe (2004:45) reported positive relationships between age and the adoption behavior of farmers and the resulting production efficiency. He indicated that, generally it is assumed that younger people are more open to ideas than older ones and therefore, are believed to be more likely to adopt agricultural technologies relatively.

Age seems to have a little influence on the middle-aged respondents of the control group, who consider themselves as emerging farmers. Some findings indicate negative relationships between age and adoption behaviour of farmers, which confirms the Fisher's exact test results for the control group.

Table 4.9 below presents farmers aspirations in five years time based on age.

Table 4.9: Respondents' aspirations in five years time based on age

Trained Respondents												
Farmers aspirations	**Age Groups**								**Total**		**Fisher's exact test**	
	<=35		36 - 50		51 - 65		>65					
	n	%	n	%	n	%	n	%	n	%	value	p
Subsistence	4	20	12	33	23	55	21	55	60	44	12.3	0.051
Emerging	4	20	8	22	9	21	6	16	27	20		
Commercial	12	60	16	45	10	24	11	29	49	36		
Total	20	100	36	100	42	100	38	100	136	100		
Control Group												
Subsistence	1	100	4	80	8	80	3	60	16	76	6.5	0.475
Emerging	0	0	0	0	2	20	2	40	4	19		
Commercial	0	0	1	20	0	0	0	0	1	5		
Total	1	100	5	100	10	100	5	100	21	100		

Table 4.9 shows that 60 percent respondents in the age group =< 35 and 45% in the age group 36-50 years of age aspire to be commercial farmers, as compared to 5 percent and 14 percent in Table 4.8. This shows an increase of 55 percent and 31 percent respectively. The increase of older respondents aged 51 to over 65 years of age in trained respondents is minimal, from zero percent and three

percent in Table 4.8 to 24 percent and 29 percent in table 4.9 respectively. The Fisher's exact test (f = 12.320, p = 0.051) shows a relative significance difference, with younger respondents visioning themselves as commercial farmers, while older respondents still see themselves as subsistence farmers even after five years time. The results of the control group shows that respondents will still be subsistence farmers in all age groups even after five years. The Fisher's exact test results (f = 6.566, p = 0.475) did not show any significant relationship. These concludes that trained respondents definitely aspire to improve their farming operations as a result of the acquired knowledge, while the control group did not have that aspiration.

4.3.8.3 Farmers' perception and aspirations based on education level

The level of farmer education within the three farmer categories was determined for both trained and control group and the results are presented in Table 4.10.

Table 4.10: Respondents' current perception and future aspirations based on education level

Trained Respondents								
Farmers perception at present	**Education Level**				**Total**		**Fisher's**	
	No education		Some education					
	n	%	n	%	n	%	value	p
Subsistence	54	92	68	80	122	85	5.903	0.053
Emerging	5	8	10	12	15	10		
Commercial	0	0	7	8	7	5		
Total	59	100	85	100	144	100		
Control Group								
Subsistence	5	83	14	93	19	90	-	0.500
Emerging	1	17	1	7	2	10		
Commercial	0	0	0	0	0	0		
Total	6	100	15	100	21	100		
Farmer aspirations in five years time	**Trained Respondents**				**Total**		**X^2**	
	No education		Some education					
	n	%	n	%	n	%	value	p
Subsistence	27	46	38	45	65	45	.369	0.831
Emerging	13	22	16	19	29	20		
Commercial	19	32	31	36	50	35		
Total	59	100	85	100	144	100		
Control Group								
							Fisher's	
Subsistence	4	67	12	80	16	76	1.595	0.678
Emerging	2	33	2	13	4	19		
Commercial	0	0	1	7	1	5		
Total	6	100	15	100	21	100		

The results of Table 4.10 shows that 92 percent of trained respondents with no education regard themselves as subsistence farmers, and only 8 percent literate respondents regard themselves as commercial farmers at present. The Fisher's exact test (f = 5.903, p = 0.053) shows a relative significant relationship, namely

the more literate respondents the more they perceive themselves as commercial farmers.

In five years time, 46 percent of respondents with no education still to be farming on subsistence level, and 36 percent of literate respondents aspire to be commercial farmers. The Pearson chi-square results (x^2 = .369, p = 0.831) did not show any significant difference.

More than three quarter (83 percent) of respondents with no education and 93 percent of literate respondents in the control group are subsistence farmers at present. The results of Fisher's exact test (p = 0.500) did not show any difference. This concludes that education has no effect on farmer categories.

The control group results after five years indicate that 80 percent of literate respondents are still subsistence and only seven percent are commercial. Thirty-three percent of respondents with no education will be emerging farmers. The Fisher's exact test (f = 1.595, p = 0.678) shows no significant difference. Thus, farmer classification according to categories is not influenced by education status.

Generally the information in Table 4.10 indicates that after five years the percentage of subsistence farmers for both trained respondents and control group has been reduced, while that of emerging and commercial farmers has increased.

Bembridge (1992) sees education as a basic and crucial factor in changing attitudes of more traditional farmers, overcoming mutual distrust in inter-personal relations, hostility towards authority, lack of innovativeness, fatalism and limited aspirations. He found with small-scale farmers in Venda that there is a positive correlation between their level of education and their management ability. According to him, it must be understood that a person who is not well educated, feels threatened by the onslaught of modern science because he cannot form a good understanding of the real significance of new recommendations and also

cannot understand how he can benefit from it. Rogers (1983:251) has also reported that earlier adopters have more years of education than the later adopters have, this confirms the Fisher's exact test results as literate respondents perceive themselves as commercial farmers.

Although positive relations are found in most cases, Gorfe (2004) reported that significantly large number of studies does not show any relationship between the education level of the farm operator and his adoption behaviour; this also supports the Fisher's exact test results where education seem not to have effect on farmers categories. The role that training programs played should not be underestimated, it has influenced the trainees to aspire to be commercial farmers.

4.3.8.4 The relationship between size of land and farmer categories

The study assumed that field size might have an effect on the respondents' decision-making in relation to their farming operations. The results of farmers' perceptions and aspirations with regard to farmer categories and the influence of field size, are presented in Table 4.11.

Table 4.11: Respondents' current perception and future aspirations based on size of land

Trained Respondents										
Farmer perception of farmer categories	**Field Size in hectares (ha)**						**Total**		**Fisher's exact test**	
	<=5		6 - 10		>10					
	n	%	n	%	n	%	n	%	value	p
Subsistence	44	90	44	90	28	76	116	86	10.248	0.022
Emerging	4	8	5	10	3	8	12	9		
Commercial	1	2	0	0	6	16	7	5		
Total	49	100	49	100	37	100	135	100		
Control Group										
Subsistence	6	86	5	83	8	100	19	90	1.673	0.505
Emerging	1	14	1	17	0	0	2	10		
Commercial	0	0	0	0	0	0	0	0		
Total	7	100	6	100	8	100	21	100		
Farmer aspirations in five years time	**Trained Respondents**						**Total**		**X^2**	
	n	%	n	%	n	%	n	%	value	p
Subsistence	26	53	24	49	12	32	62	46	5.521	0.238
Emerging	9	18	11	22	7	19	27	20		
Commercial	14	29	14	29	18	49	46	34		
Total	49	100	49	100	37	100	135	100		
Control Group										
									Fisher's	
Subsistence	6	86	4	66	6	75	16	76	2.755	0.792
Emerging	1	14	1	17	2	25	4	19		
Commercial	0	0	1	17	0	0	1	5		
Total	7	100	6	100	8	100	21	100		

The results in Table 4.11 shows that 90 percent of the respondents who own 5 to over 10 ha of land perceive themselves as subsistence farmers, and only 16 percent of respondents with more than 10 ha of land perceive themselves as commercial farmers. There is a significant difference according to Fisher's exact test (f = 10.248, p = 0.022).

More important however is the changes that occur with regard to respondents' aspirations in five years time. According to Table 4.11 the following changes occur.

(i) Respondents with 5 ha or less

Ninety percent perceived themselves to be subsistence farmers, but in five years time only 53 percent still perceive themselves as in the same category. A total of 37 percent of the respondents aspired to be either emerging or commercial farmers.

(ii) Respondents with between 6 and 10 ha

Ninety percent perceived themselves to be subsistence farmers. In five years time only 49 percent still perceive themselves in the same farmer category. A total of 42 percent of the respondents aspire to be either emerging or commercial farmer.

(iii) Respondents with more than 10 ha of land

Seventy percent perceived themselves to be subsistence farmers. In five years time only 32 percent still perceive themselves as subsistence farmers. A total of 44 percent of the respondents aspire to become emerging or commercial farmer.

According to the above findings, the larger the size of the land, the more the respondents aspires to become an emerging or commercial farmer.

At present the analysis on control group shows that regardless of field size almost all respondents (90%) are subsistence farmers. The Fisher's exact test results ($f = 1.673$, $p = 0.505$) did not show any difference. This concludes that field size does not influence farmer category within the control group. Five years later in the control group, the majority still perceive themselves as subsistence farmers, and only 25 percent of those with more than 10 ha of land aspire to become emerging farmers. The Fisher' exact test result ($f = 2.755$, $p = 0.792$) did not show any different. The findings on control group conclude that field size does not influence farmer's perception in regard farmer categories.

The results of Table 4.11 are supported by Abd-Ella et al (1981:45) who reported that larger farm size means more resource and greater ability to take the risk involved in the adoption of recommended practices. Rogers (1983:252) has also generalized that early adopters have a larger-sized units than later adopters. Literature is in agreement with this generalization, i.e. farm size is found to be positively related with adoption.

4.3.9 Farmer's expectations

To find out if the farmers' expectations were met during training, the respondents were asked the question; **"Did the courses you attended meet your needs or expectations?"** This is indicated in the Figure 4.3 below.

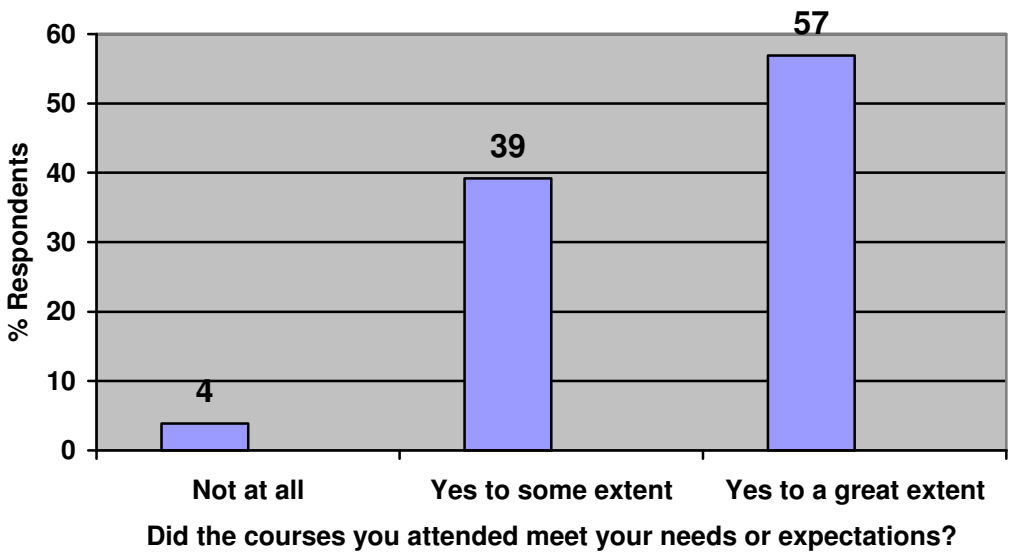


Figure 4.3: Respondents' expectations about the courses they attended

In Figure 4.3 above only four percent of the respondents indicated that their expectations were not met at all, as compared to 57 percent of the respondents who said that their expectations were met to a great extent.

The study intended to get the feeling of respondents about the courses, and they were asked to indicate whether government should continue providing farmer-training courses. The responses are indicated in Table 4.12 below.

Table 4.12: Opinion of Respondents on provision of training by government

Variable		Respondents								Total	
		Agents		Support		Farmers		Instructors			
		n	%	n	%	n	%	n	%	n	%
Should government continue to provide farmer-training courses	Yes	33	100	8	90	149	99	4	80	194	98.5
	No	0	0	1	11	1	1	1	20	3	1.5
Total		33	100	9	100	150	100	5	100	197	100

Fisher's exact test = 5.245, p = .121 significance

Almost all the respondents (98.5) agree that government should continue providing courses. The two managers whose questionnaires were collected also agreed that courses should be provided for farmers.

4.3.10 After care service to farmers by extension agents

It is important that the extension agent should regularly contact his clients to advice them and get their feelings about his services. The study wanted to know if the extension agent usually visited the respondents after training. The results are illustrated in Figure: 4.4 below.

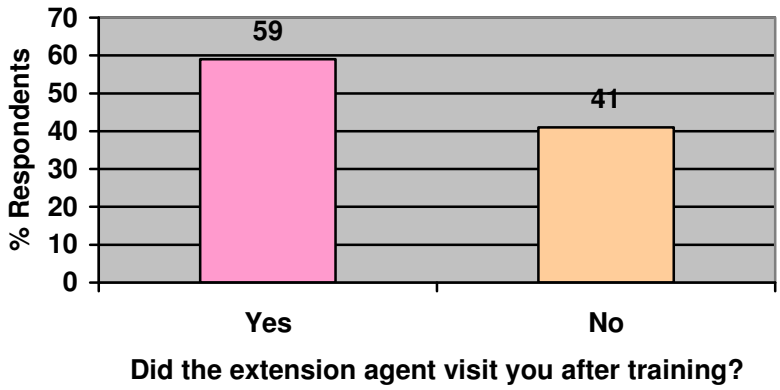


Figure 4.4: Farmers responses on extension agent's visit after training

The results above show that 59 percent of the respondents indicated that the extension agent usually visits them after training, while 41 percent indicated the opposite. This is important to motivate farmers to take action in regard to what they have learnt. In relation to the extension agent's visit to farmers, it is also important to get the perception of the respondents as regard to the number of farmers being served by each extension agent. The respondents were given four options as shown in Table 4.13.

Table 4.13 Respondents' perception about number of farmers per extension agent

Perception of respondents	RESPONDENTS CATEGORIES						Total	
	Agents		Farmers		Control			
	n	%	n	%	n	%	n	%
Don't know	1	3	14	10	3	14	18	9
Unmanageable / too many	25	76	94	63	15	72	134	66
Not sufficient / too few	1	3	1	1	0	0	2	1
Sufficient / manageable	6	18	39	26	3	14	48	24
Total	33	100	148	100	21	100	202	100

Fisher's exact test = 6.267, p = 0.356 significance

A total of 66 percent of all respondents indicated that the number of farmers per extension agent is unmanageable. There is however 26 percent of farmers who indicated that the ratio is manageable. Although the difference between the three

categories of respondents is not significant, the extension agents (76%) indicated a higher percentage than the two farmer groups.

The fact that all three categories of respondents perceive the number of farmers per extension agent to be unmanageable need to be taken seriously into consideration. This results support the findings in Figure 4.4 where 41 percent of respondents indicated that the extension agent did not manage to visit them after the training program. It strengthens the importance of regular visits to farmers as a factor that could motivate farmers to implement new skills and knowledge.

4.3.11 Respondents' perception about the content of courses

The study intended to know the perception of respondents in relation to content of the courses offered. The results are presented in Table **4.14.**

Table 4.14: Respondents' perception about courses presented at DRTC

Categories of course content	RESPONDENTS CATEGORIES								TOTAL	
	Agents		Support		Instructors		Farmers			
	n	%	n	%	n	%	n	%	n	%
Too theoretical	20	61	1	11	3	60	21	14	45	23
Too practical	1	3	0	0	0	0	10	7	11	6
Well balanced	12	36	8	89	2	40	119	79	141	71
Total	33	100	9	100	5	100	150	100	197	100

Fisher's exact test = 32.630, p = 0.000 significance

According to the perception of respondents in Table 4.14, sixty-one percent of extension agents and 60 percent of instructors feel that the courses are too theoretical. On the other side, 89 percent of support staff and 79 percent of farmers feel that the courses are well balanced. The results of Fisher's exact test (f = 32.630, p = 0.000) show a significant relationship between the respondents' categories and the categories of course content. In total 71 percent of all the respondents indicated that the content of the courses are well balanced. The fact that the extension agents and instructors indicated that the course content is too theoretical needs further research.

According to Bembridge (1991:48), people learn only what they want to learn. It follows that anything taught to farmers must be seen to satisfy need, whether real or imagined. Most adult learning is by seeing (eighty-three percent), followed by hearing (eleven percent) and other senses (six percent). Adults are more likely to remember a solution they have worked out for themselves rather than one which has been given to them by the trainer. They also are more likely to act on decisions made by themselves rather than those made by the trainer. In general, people learn best when they actually do the job, next best from what they see, and then from what they hear and read.

The conclusion of the results in Table 4.14 is that courses according to extension agents and instructors are too theoretical; this implies that during training farmers do not do much practical training of what they have learned. As such they leave the training centre without a base for implementation of the acquired knowledge. However farmers and support staff are of the opinion that courses are well balanced.

4.3.12 Allocated time per course

The time allocated per course could have an effect on the amount of the material delivered and the speed at which it is done. The respondents' perception on the time allocated per course is presented in Table 4.15.

Table 4.15: Respondents perception about time allocated per course

Categories of time allocated per course	RESPONDENTS CATEGORIES								TOTAL	
	Agents		Support		Instructors		Farmers			
	n	%	n	%	n	%	n	%	n	%
Too little	13	39	3	33	5	100	64	43	85	43
Too much	2	6	0	0	0	0	3	2	5	3
Sufficient	18	55	6	67	0	0	82	55	106	54
Total	33	100	9	100	5	100	149	100	196	100

Fisher's exact test = 9.309, p = 0.130 significance

Although there is no significant relationship between respondents categories and categories of time allocation, the instructors (100%) clearly indicated that the time allocated is totally insufficient. The fact that 43 percent of the farmers indicated that the time is insufficient deserves a serious note, and it is in line with extension agents and support staffs' perception.

4.3.13 Assessment of farmers needs by frontline extension agents

In investigating the factors that determine adoption and non-adoption of agricultural technologies, the study asked the extension agents "**How do you assess farmers' needs in your extension area, talk to individual farmers, address the farmers committee, or talk to leaders**?" The results are presented in Figure 4.5 below.

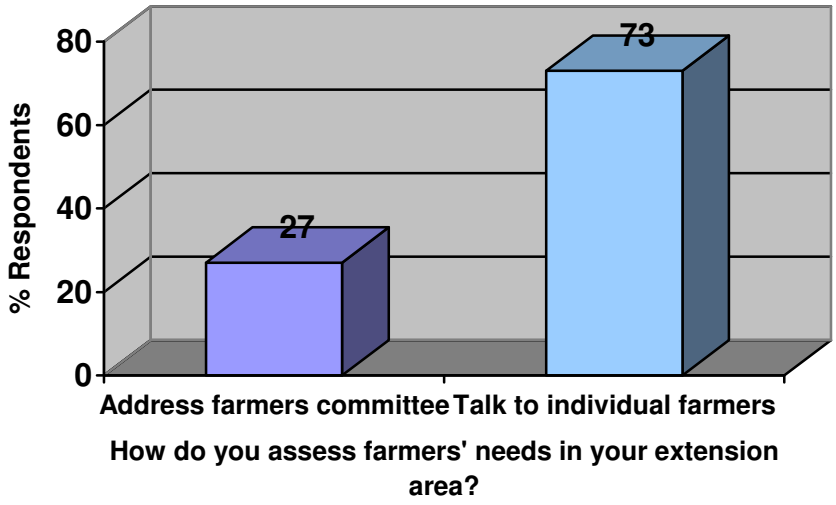


Figure 4.5: Assessment methods of farmers needs by extension agents

Almost three quarters (73 percent) of the extension agents indicate that they talk to individual farmers in order to assess their needs. De Beer (2000:63-64) argues that need based development is an acceptable departure point in the methodologies of extension; and where behaviour is directly focused on the goal

as a means for need satisfaction. The most important function of extension will always remain the identification of needs (felt and unfelt needs) according to which development are to be planned, initiated and adapted.

On the other hand, Mwangi and Rutatora (2002:31) indicate needs assessment as the process that enables extension agents to identify and provide effective educational programs that address current needs of clients, while projecting emerging priorities, plan forward and evaluate alternative solutions in order to make current program decisions, determine appropriate goals for various programs and solve the right problems.

4.3.14 Extension agents, support staff and instructor's visits to farmers

For training to be effective, extension agents and other staff have to conduct follow-up visits to trained farmers. To determine this, respondents were requested to indicate the time span between training and first visit by extension staff. The results are illustrated in the Table 4.16 below.

Table 4.16: Farmers' visits after training by staff

Categories of visits after training	Respondents Categories						Total	
	Agents		Support		Instructors			
	n	%	n	%	n	%	n	%
>30 days	5	16	1	11.1	0	0	6	14
21-30 days	8	25	2	22.2	1	20	11	24
11-20 days	14	43	3	33.3	1	20	18	39
<10 days	5	16	3	33.3	3	60	10	23
Total	32	100	9	100	5	100	46	100

Fisher's exact test = 8.172, p = .411 significance

Most of extension agents (43%) and 33.3 percent support staff visited farmers between 11 to 20 days after training, while 60 percent of the instructors indicated that they visited farmers within a period of less than ten days. The results of

Fisher's exact test (f = 8.172, p = 0.411) show no significant relationship, and according training staff farmers are visited between thirty days after training.

4.3.15 Instructors' capability

The capability of instructors who teach farmers at DRTC is a critical issue, which could play an important role in adoption and non-adoption of technologies by farmers. Table 4.17 presents the respondents perception about the capability of instructors.

Table 4.17: Instructors capability as perceived by respondents

Categories of capability	Respondents Categories						Total	
	Agents		Support		Farmers			
	n	%	n	%	n	%	n	%
Unsuccessful	0	0	0	0	4	3	4	2
Successful	24	73	5	56	70	46	99	51
Very successful	9	27	4	44	78	51	91	47
Total	33	100	9	100	152	100	194	100

Fisher's exact test = 7.802, p = 0.080 significance

The results show that 73 percent of extension agents and 56 percent of the support staff and 46 percent of the farmers feel that instructors are successful in presenting the material or teaching the farmers. The Fisher's exact test (f = 7.802, p = 0.080) shows a significant difference between the respondents' categories and the categories of capability of farmers. This concludes that instructors are capable of teaching the farmers. An aspect that needs to be addressed is the fact that 100 percent instructors indicated that they need more time to present the courses (Table 4.15)

4.3.16 Payment for training courses by farmers

At present farmer training courses in Botswana are free. The study intended to find out how extension staff feels about the present arrangement for courses. They were asked the question "**Do you think farmers should pay to attend farmer training courses**?" See Figure 4.6 for the results.

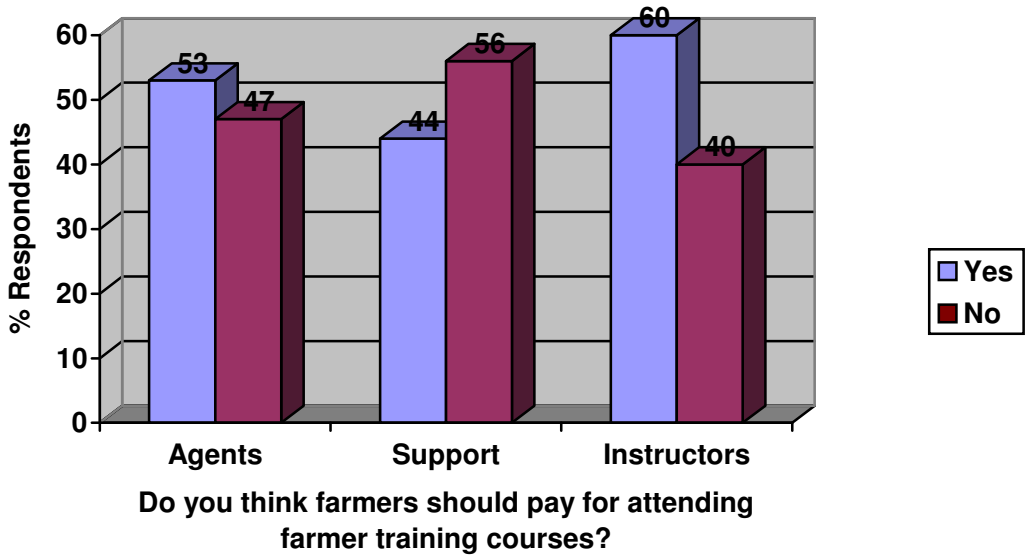


Figure 4.6: Respondents' views about paying for training courses by farmers

According to the above Figure, 53 percent of the extension agents and 60 percent of instructors, including the two managers interviewed proposed that farmers should pay for courses. Only 56 percent of the support staff supported the idea that farmers should not pay for courses. The Fisher's exact test (f = .465, p =0.904) however does not show any significant relationship.

The staff was asked to give reasons why they say farmers should pay or should not pay for training. The results are presented in Table 4.18.

Table 4.18: Reasons why farmers should pay or not pay for training courses

Reasons	Respondents						Total	
	Agents		Support		Instructors			
	n	%	n	%	n	%	n	%
Payment encourages commitment & implementation	17	63	3	43	3	60	23	59
Farmers can not afford to pay for courses	10	37	4	57	2	40	16	41
Total	27	100	7	100	5	100	39	100

A total of 63 percent extension agents and 60 percent instructors including the two managers interviewed, feel that if farmers pay for training, they will be more serious, and committed to implement what they have learnt. They also indicated that only serious farmers would pay to attend. On the other hand most of the support staff (57 percent) feels that most of the farmers are subsistence farmers and as such they cannot afford to pay for training. At present training is free and there could be a lack commitment from respondents. On several occasions farmers send their sons and daughters to attend courses on their behalf, this was confirmed during the survey of this study by respondents. Unfortunately, they do not teach parents on their return from training. (Observation made by interviewers)

4.3.17 Support staff and Instructors perception of the program

Another important factor considered by the study, was to find out if the courses have well-established programs for teaching different levels of farmers. The results are presented in Figure 4.7.

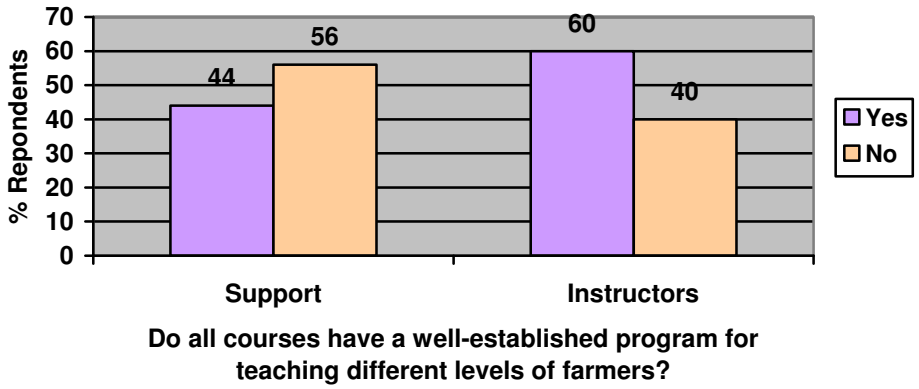


Figure 4.7: Staff responses on well-established program for training courses

The conclusion drawn from the results of Figure 4.7 is that according to instructors (60%) courses have well-established programs, while only 44% of support staff agree with instructors.

4.3.18 Instructors' teaching methods

The study investigated the methods mostly used by instructors in teaching respondents, and 60 percent of the instructors indicated that lecturing and discussion is the method they use. All instructors indicated that they have been trained on how to train or teach adults.

4.4 Farmers' contribution to the development of the training programs and the criteria for selecting course participants.

4.4.1 The extent to which farmers contribute to the development of the training programs.

In Chapter One of this study Olivier (2000) indicated that since adult learners will learn best what is most relevant to them, they must be involved in the determination of their own training needs and planning of a learning management

system. In Figure 4.8 the respondents indicated to what extent they participated in the development of the training courses.

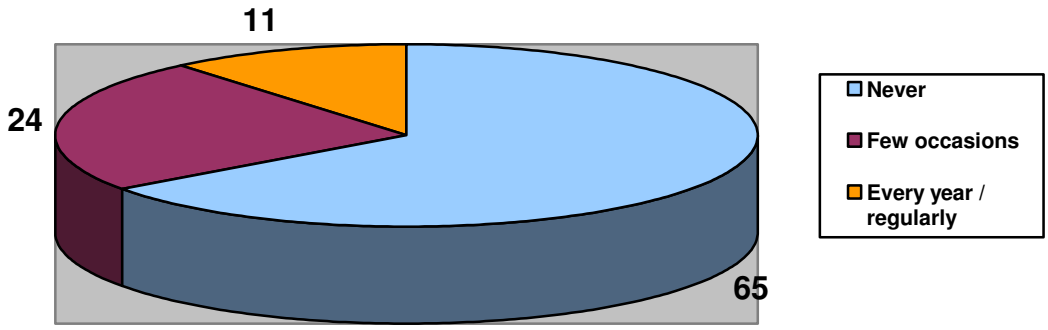


Figure 4.8: Respondents' involvement in training courses development

The results show that 65 percent of the respondents indicated that they were never involved in developing the courses they attended, and only 11 percent indicated that they were involved every year. The question then arises, who was responsible for developing the training courses.

According to Rutatora and Mattee (2001:91) literature reveals that from the very beginning extension services were offered through what has been termed the "banking", top-down, and empty-cup or directive approach. All too often extension services have been structured and operated on the assumption that farmers are passive, ignorant, illiterate, and they are unable to improve or to integrate new farming practices into their established agricultural systems.

Hope and Timmel (1990:9) also used the term "banking approach" to describe the conventional paradigm because the trainer was seen as possessing all the essential information while the learners were seen as "empty vessels" needing to

be filled with knowledge. In Table 4.19 below respondents indicated whom they believe have identified the training courses.

Table 4.19: Respondents perception of who was responsible for development of training courses.

Categories of responsibility	Frequency	Percent
Don't know	5	4
Others	4	3
Extension agent	113	80
Farmers committee	19	13
Total	141	100

The results show that 80 percent of the respondents felt that the courses were identified by extension agents, as compared to 13 percent who reported that they were identified by farmers committees.

Eighty percent of respondents in Table 4.19 confirmed what has been documented by Rutatora and Mattee (2001) and Hope and Timmel (1990), as they indicated that extension agents suggested the courses. A very important extension principle of participation seems to be totally neglected with regard to the development and identification of courses for farmers.

4.4.2 The methods used by extension agents to identify courses

In confirming participation of respondents, the extension agents in Table 4.20 indicated the methods they use to identify the training courses for the farmers.

Table 4.20: Methods used by extension agents to identify courses for farmers

Categories of identifying needs	Frequency	Percent
Address farmers committee	22	67
Do individual visits to farmers	11	33
Total	33	100

According to Table 4.20, 67 percent of the extension agents address the farmers committees to identify courses. This is done with the assumption that, the committees represent the views of the community**.** A farmers' committee is a committee, which represents the interests of the farmers within the village / extension area and it is elected by the farmers.

4.4.3 Farmers participation in the identification of training courses according to extension agents and support staff

The extension staff also indicated the extent to which farmers are involved in the identification of the training courses; the results are presented in Table 4.21.

Table 4.21: The extent of farmers' involvement in identifying training courses according to staff

Categories of involvement	Respondents				Total	
	Agents		Support staff			
	n	%	n	%	n	%
Not involved at all	1	3	0	0	1	2
To a less extent	8	24	2	22	10	24
To a fair extent	14	43	6	67	20	48
Fully involved	10	30	1	11	11	26
Total	33	100	9	100	42	100

Fisher's exact test = 2.164, p = 0.560 significance

The results of Table 4.21 show that less than half (43 percent) of extension agents and more than half (67 percent) of the support staff reported that farmers are to a fair extent involved, while only more than a quarter (30 percent) of extension agents and 11 percent of support staff indicated that farmers are fully involved. The results of Fisher's exact test (f = 2.164, p = 0.560) show no significant relationship. Most of the staff (48%) reported that farmers are involved to a fair extent in identification of the courses they attend. This finding is in contrast with the results of Figure 4.8 where 65 percent of the trained

respondents indicated that they were never involved in identifying the courses they attended.

The frontline extension agents and support staff were asked to rate the involvement of farmers on a scale of one to ten, as indicated in Figures 4.9 and 4.10.

Scale rating:

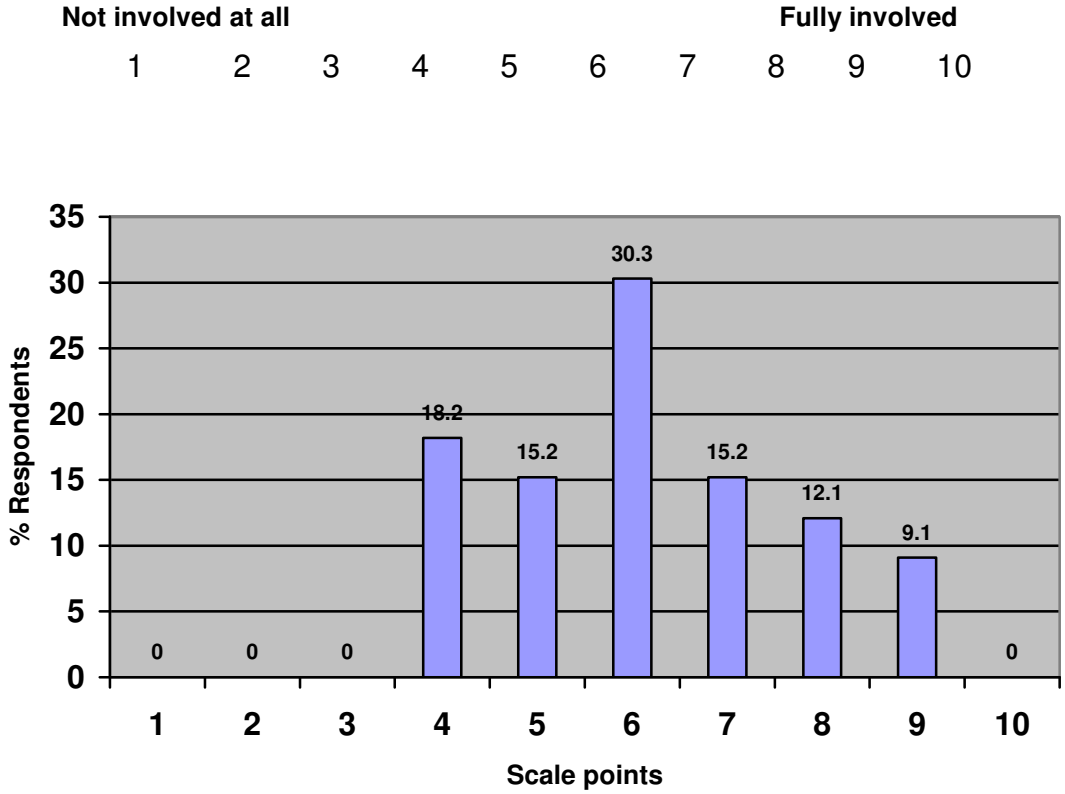


Figure 4.9: Extension agents' ratings for farmers' involvement

The results in Figure 4.9 show that 78.9 percent of the respondents reported that farmers are involved to some extent, while 21% are fully involved. These results support the results in Table 4.21.

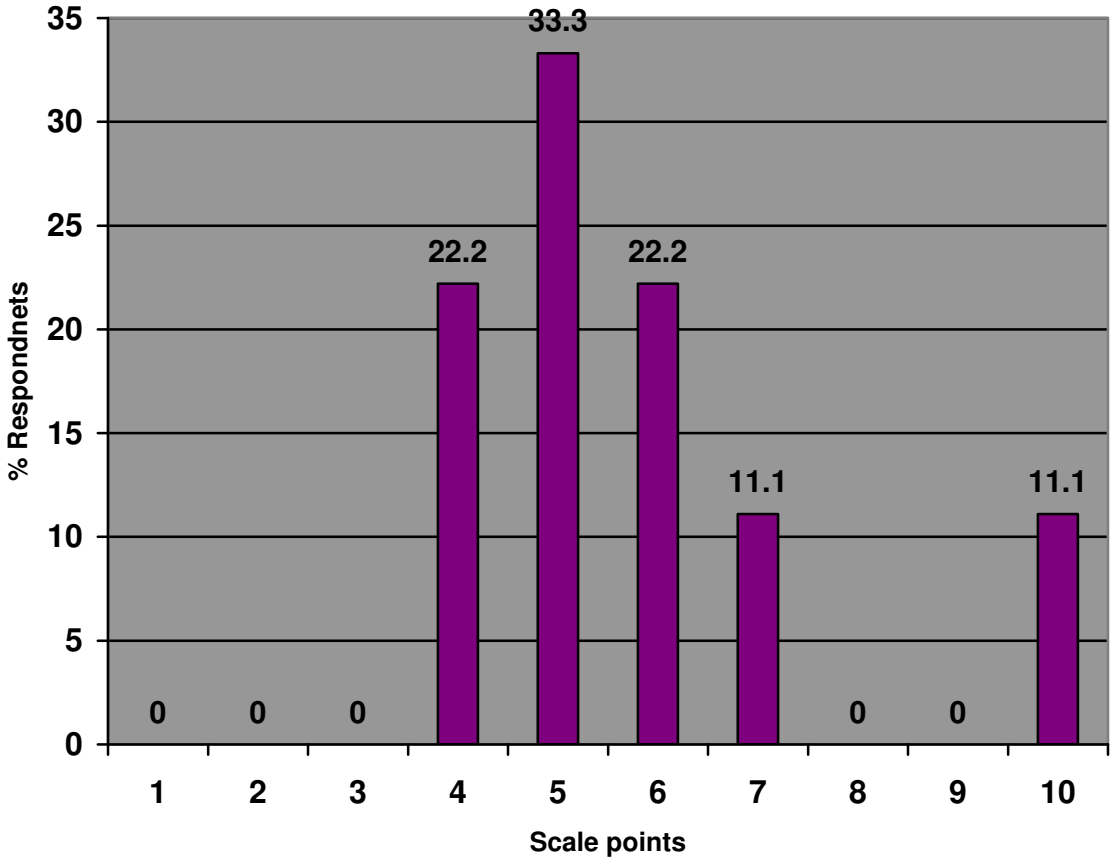


Figure 4.10: Support staff ratings for farmers' involvement

These results also support results of Table 4.21 and Figure 4.9, eighty-nine percent of respondents reported that farmers are involved to a fair extent in identification of the courses they attend. This concludes that farmers are not fully involved in the process of identifying the courses, which are meant to address their needs.

4.4.4 The methods used for selecting course participants

It is the responsibility of extension staff to identify farmers to attend training courses. In Table 4.22 the extension staff indicated the best methods for selecting course participants.

Table 4.22: Methods used by extension staff for selecting course participants

Categories of methods	Respondents				Total	
	Agents		Support			
	n	%	n	%	n	%
(3) Both 1 & 2	19	59	6	75	25	62
(2) Interested farmers	6	19	0	0	6	15
(1) Farmers with projects	7	22	2	25	9	23
Total	32	100	8	100	40	100

Fisher's exact test = 1.451, p = 0.544 significance

In selecting course participants, 62 percent of extension staff prefers farmers from both categories. The interesting aspect is that support staff does not perceive interested farmers as a good method. May be it is because of the fact that they are not involved with farmers on daily bases like the frontline extension agents. The Fisher's exact test (f = 1.451, p = 0.544) did not indicate any significant relationship.

4.5 Impact of the knowledge gained from the training program on the farming practices of the trainees

Richardson (1999:46) argues that in judging public benefit, "people impact" is a key factor in program accomplishments. The people impacts may be indicated as financial gains, taxpayer savings; efficiencies gained; environmental enhancements or protection; individual life enhancements; resource preserved; or societal improvements.

4.5.1 Trained farmers

In trying to find out the impact of training, the study requested trained respondents to indicate the impact of the training program on their production efficiency, see Table 4.23 for results.

Table 4.23: Status of training impact on farmers' production efficiency

Categories of impact	Frequency	Percent
No impact at all	55	36
Moderate impact	68	45
Positive impact	28	19
Total	151	100

The results show that 36 percent of the respondents felt that the courses did not have any impact on their production efficiency, 45 percent reported a moderate impact, while only 19 percent indicated a positive impact.

4.5.2 Usefulness of the knowledge

Impact, according to Richardson (1999) is described in the context of what happens as a result of what we do; that is learning developed (attitudes, knowledge, skills); behaviour change (application of what is learned); and impacts of results on customers and general public. The critical issue according to Fremy (2000:45) is the ability and capacity of the stakeholders to transform good visions prepared in offices into actions in the field through a progressive and practical result oriented manner.

The most important thing for trainees is to utilize the knowledge they have acquired. In Table 4.24 the trained farmers indicated the usefulness of the training programs and the knowledge gained.

Table 4.24: The perception of trained respondents about the usefulness of acquired knowledge

Categories of usefulness	Frequency	Percent
Not useful	21	14
Quite useful	58	38
Very useful	74	48
Total	153	100

Almost half of the respondents (48 percent) indicate that the knowledge is very useful in their own situations.

Respondents were then requested to rate the usefulness of the knowledge on a ten-point scale.

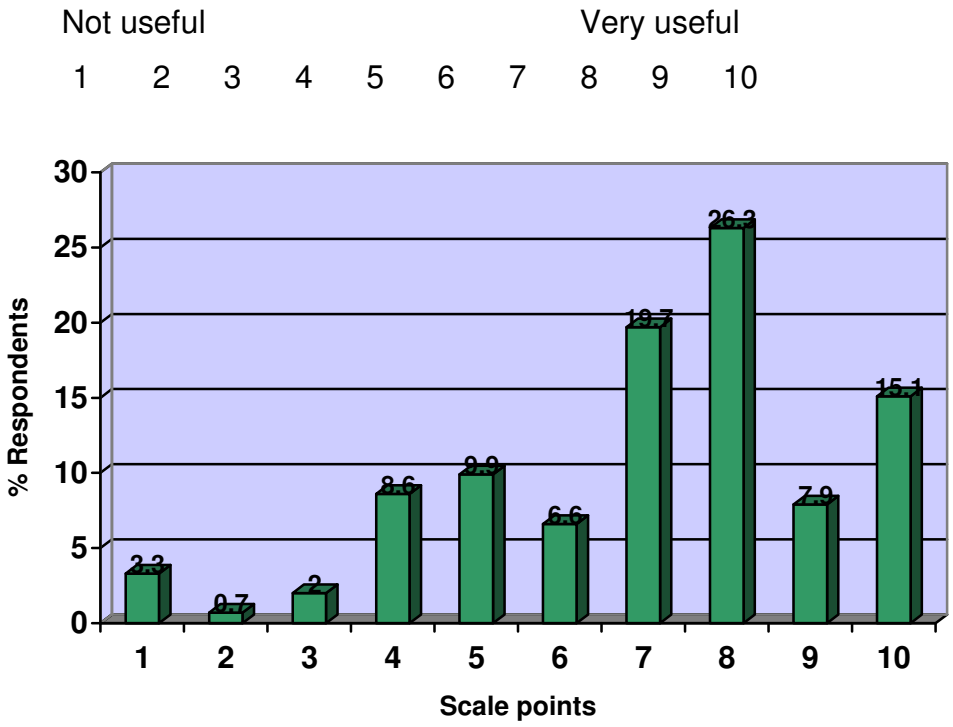


Figure: 4.11 Respondents' perception about usefulness of the knowledge

About 49.3 percent of the respondents gave a rate of very useful on the scale, which confirms the information in Table 4.25 where 48% indicated that the knowledge from the courses is very useful.

Since most of the respondents indicated that the knowledge was useful, they were requested to indicate if they have used the acquired knowledge. See Table 4.26 below for the results.

Table 4.25: Status of how respondents have used the knowledge

Categories of use	Frequency	Percent
Never	55	36
Seldom	28	18
Often	70	46
Total	153	100

The results show that 36 percent of the respondents have never used the knowledge, while 46 percent of them did use the knowledge often.

The information in Table 4.25 shows that 48 percent of the respondents are certain that the knowledge from training is very useful. This is confirmed by Table 4.26 results, 46 percent of respondents use the knowledge very often. The disappointing aspect is that the result of the knowledge used does not show on the trainees' production efficiency. May be the respondents did not disclose all the information to the interviewers, because of its sensitive nature.

4.5.3 Control group

In relation to trained farmers' production efficiency, the control group was asked to compare their production efficiency with the production efficiency of trained farmers. The results are illustrated in Figure 4.12 below.

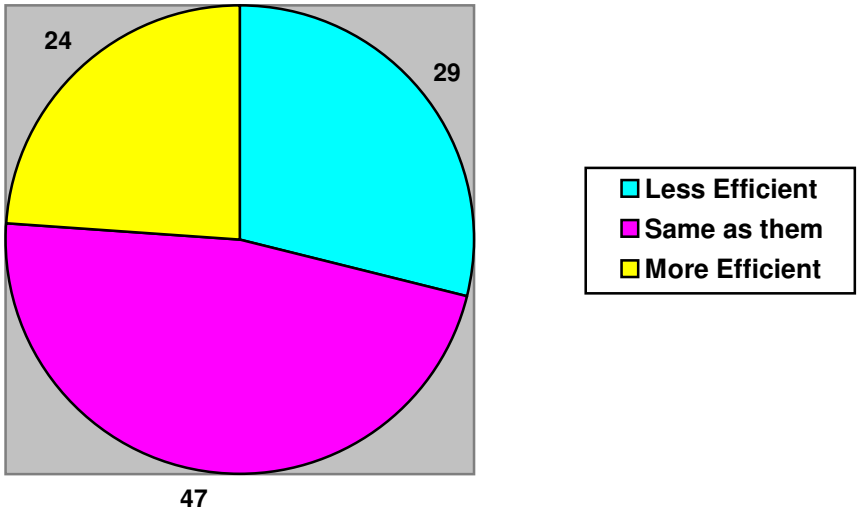


Figure 4.12: Control group's perception about their production efficiency in regard to trained farmers

Nearly 50 percent of the control group respondents, as shown in Figure 4.12 feel that their production efficiency is the same as for trained farmers. The fact that 24 percent of the farmers who never attended training courses indicated that they are more efficient than the trained farmers must be seen as a warning light with regard to the effectiveness of the training courses.

The study established that 29 percent of them felt that trained farmers do not implement / adopt technologies. Fourteen percent (14%) say it is because of shortage of resources and 10 percent say it is due to social commitments. These were the reasons given by control group why trained farmers do not excel in production efficiency.

4.5.4 Extension staffs' perception about effectiveness of courses

The frontline extension agents, support staff and managers were asked to indicate the extent to which courses offered at DRTC are effective in assisting the farmers. The results are presented in Table 4.27.

Table 4.26: Effectiveness of courses in assisting farmers as perceived by extension staff

Categories of effectiveness	Respondents				Total	
	Agents		Support			
	n	%	n	%	n	%
Not effective at all	1	3	0	0	1	2
To a less extent	7	21	1	11	8	19
To a fair extent	15	46	6	67	21	50
Very effective	10	30	2	22	12	29
Total	33	100	9	100	42	100

Fisher's exact test = 1.450, p = 0.753 significance

The fact that 21 percent of extension agents indicated that the courses are effective to a less extent in assisting farmers strengthen farmers' evaluation of the courses, as 36 percent (Table 4.23) indicated that it had no impact on their production efficiency. It is further strengthened by the finding that only 29 percent of the extension staff indicated that the courses are very effective, while only 19 percent of the farmers (Table 4.23) indicated that it had a positive impact on their production efficiency. The two managers interviewed also felt that the courses are effective to a fair extent. The results of Fisher's exact test (f = 1.450, p = 0.753) indicated no significant relationship.

In Table 4.27 extension staff indicated their perception of why courses were effective or not effective to trained farmers.

Table 4.27: Explanation of why courses are effective or not effective

Reasons for course effectiveness and non-effectiveness	Respondents				Total	
	Agents		Support			
	n	%	n	%	n	%
Farmers implement technologies	10	30	4	44	14	33
No implementation / adoption	21	64	5	56	26	62
Material not relevant to farmers' needs	2	6	0	0	2	5
Total	33	100	9	100	42	100

A total of 62 percent of all the respondents indicated that farmers did not implement or adopt the technologies attained from training courses. Only 33 percent indicated that farmers did implement the new technologies. In Table 4.27 the same respondents indicated that courses are effective to a fair extent in assisting farmers. This concludes that courses are not effective. This is also confirmed in Figure 4.12, where 47 percent of the control group indicated that their production efficiency is the same as for the trained respondents.

4.5.5 Status of adoption as perceived by extension staff

One of the main objectives of the study was to determine to what extent trainees have implemented the acquired knowledge. Frontline extension agents, support staff and instructors in Table 4.28 indicated the status of implementation of the acquired knowledge or technology as perceived by them during follow-up visits to trained farmers.

Table 4.28: Status of implementation of acquired knowledge during follow-up visits

Variable	Categories	Respondents						Total	
		Agents		Support		Instructors			
		n	%	n	%	n	%	n	%
What is usually the status of implementation of acquired knowledge when making follow-up visits	Positive	12	36	3	33	2	40	17	36
	Negative	21	64	6	67	3	60	30	64
Total		33	100	9	100	5	100	47	100

Fisher's exact test = .241, p = 1.000 significance

According to the above Table 4.28, 64 percent of the respondents feel that there is no implementation of the acquired knowledge or technology. The Fisher's exact test (f = .241, p = 1.000) shows that there is no significant relationship between respondents' categories and status of implementation categories. This finding supports results of Table 4.28, where 64 percent of extension agents and 56 percent support staff reported that courses are not effective because there is no implementation.

The word negative in Table 4.28 was used to indicate non-adoption or non-implementation of acquired knowledge or technology. Boyle (1981) argues that for a change to occur, people must perceive inconsistency between themselves at present and the desired state proposed. They must accept and recognize that a need exist. The question is, did the respondents in this study perceive an inconsistency or recognize that a need exist?

It is difficult to assume that respondents perceived inconsistency at present. This is due to the fact that 65 percent of respondents in Figure 4.8 indicated that they were never involved in suggesting the courses they attended. Eighty percent of respondents in Table 4.19 confirmed that the courses were suggested by extension agents. The non-implementation of acquired knowledge by the respondents in this study, can be based on the fact that they did not perceive any inconsistency or recognize that a need exist.

In its simplest form the non-adoption of innovations and practices according to Düvel (1991:78) can be traced back to two basic causes: The individual is either uncapable or unwilling to adopt the recommended practice. Unwillingness to adopt can directly or indirectly be linked to a lacking need, and the related aspects of perception and knowledge.

In supporting implementation of innovations Düvel (1991:81) noted that an unfavourable perception concerning the relative advantages refers to both

advantages as well as disadvantages of the innovation or practice, as such the possible causes for non-adoption could thus be:

- Unaware of the advantages and / or
- Awareness of disadvantages

In this study the respondents might be unaware of the advantages of the acquired knowledge, or they may be aware of the disadvantages of implementing the knowledge, and if the disadvantages are more prominent than advantages, the respondents will not adopt the technology.

Düvel (1991) continues to indicate that both the advantages and disadvantages are need related in the sense that both contribute to the overall attractiveness (or unattractiveness), which can only come about in the context of a relevant need disposition. Innovation attributes such as advantages and disadvantages in a certain need context can be accepted to constitute positive (driving) and negative (change impeding) forces. The imbalance of negative or positive forces as cause of non-adoption would then be the result of the mentioned unawareness of advantages or an awareness of disadvantages.

The factors constituting negative forces in this study may be due to the fact that respondents were not fully involved in identification of their training courses, as such they may not value the advantages of the knowledge, and hence no implementation. The other factor is that 67 percent of extension agents (Table 4.20) indicated that they address the farmers committees to identify courses for the training program. Historically, most of the farmers committees in Botswana are not active, as such the suggestions they make, may not be representing the interests of the farming community, hence no implementation of the acquired knowledge.

Mwangi and Rutatora (2002:30) agree that needs assessment is important in the process of initiating and implementing extension programs. Lack of or poor needs assessment may lead to misperception or misunderstanding of client's needs, priorities, and genuine response to technical advice, which may cause program failure. Such misunderstanding if allowed to exist would be very costly to any nation in terms of wasted time and effort, persistent low yield due to inefficient production, low family incomes, poor adoption rates of extension recommendations and slow rate of economic growth and development.

The results of Table 4.28 show that the good intension of government to transfer technology at DRTC through training of farmers for so many years seems to be to some extent a fruitless effort and a waste of time.

4.5.6 Reasons for non-implementation as perceived by extension staff

In Table 4.29 extension staff and instructors indicated their perceived reasons why farmers do not implement the acquired knowledge after the training program. The reasons have been clustered into five clusters.

Table 4.29: Reasons for non-implementation of acquired knowledge as perceived by extension staff and instructors

Reasons for non-implementation of knowledge	Respondents						Total	
	Agents		Support		Instructors			
	n	%	n	%	n	%	n	%
Resistance or reluctant to change	5	17	0	0	0	0	5	14
Shortage of resources	15	54	5	100	3	100	23	64
Social commitments	3	11	0	0	0	0	3	8
Technologies are time consuming	3	11	0	0	0	0	3	8
Laziness	2	7	0	0	0	0	2	6
Total	28	100	5	100	3	100	36	100

The results show that the most contributing factor for non-implementation of acquired knowledge is shortage of resources. Fifty-four percent of extension

agents, 100 percent support staff and 100 percent instructors reported the same reasons for non-implementation. These resources include capital, farming implements and others. The other factor noted by extension agents is that farmers are reluctant to change. The issue of resources in adoption or implementation of innovations is very critical. As noted by Bembridge (1991:49) the solution of farmers' problems must come from or be congruent with, the learner's experience, expectations and potential resources, rather than be prescribed by an expert.

The concept of compatibility as noted by Düvel (1991:81) makes *inter alia* provision for the accommodation of needs, aspirations, preferences, etc. but also refers to other practical aspects like the labour and capital situation and others. Based on this review, the results of Table 4.29 show that the acquired knowledge is incompatible with the situational aspects of respondents; as such they cannot adopt or implement it.

According to Düvel (1991) a specific innovation or practice is not compatible with the individual's need, if it is not perceived as need related, or a means toward achieving it. Need compatibility, is therefore, assumed to be positively related with adoption behaviour and the corresponding production efficiency, if the realization of one need will simultaneously or indirectly lead to the realization of another.

CHAPTER FIVE
SUMMARY CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Since the establishment of the first rural training centre in Botswana in 1967, formal training of farmers at a large scale has been going on a continuous basis. Farmer training is done by the Department of Crop Production and Forestry, to transfer appropriate technologies released by research for rural area farmers.
Even-though training of farmers has been going on for so many years; its impact on the farming practices of the trainees is not visible. This has been supported by TAHAL Consulting Engineers report (2000) that despite the importance of the agricultural sector in the country, its contribution to Gross Domestic Product (GDP) continues to decline.

The previous study done by Montsho (2002) focused on adoption of technologies by horticultural farmers. The information from this study is scanty, and it did not address the variation in behaviour, i.e. practice adoption of all trained farmers. This study endeavors to shed more light on the critical behaviour determinants, which are, according to Lewin (1951) and Düvel (1991), associated with the cognitive field. As such the purpose of this study was to evaluate the perceived impact of training on farmers' production efficiency. Three objectives were formulated for the study namely:

1. To investigate the factors that determine adoption and non-adoption of agricultural technologies (reasons)
2. To investigate (a) the extent to which farmers contribute to the development of the training programs and (b) the criteria for selecting course participants

3. To determine the impact of the knowledge gained from the training program on the farming practices of the trainees. Primarily those who adopted the practices from the training program.

Based on the objectives, two hypotheses were also formulated.

Hypothesis one: The poor impact of training on farmers' production efficiency is a function of non-adoption or non-implementation of acquired knowledge or technology.

Hypothesis two: Training offered at Denman Rural Training Centre does not address the intervening variables for participants, such as needs and perception.

The study was conducted in the southern part of Botswana, at Gaborone agricultural region, which is served by DRTC in terms of farmer training. Data was collected from February – April 2005, in five agricultural districts, which forms Gaborone region. Systematic sampling was employed to select 160 farmers. This represents a sample size of 20 percent and it's assumed to be large enough to represent 800 farmers who were trained at DRTC since 2001 to 2003.

The principal techniques used for data analysis include two measurement scales of nominal and ordinal. Frequency distribution, summary statistics together with tables and charts were employed. The Chi-square and Fisher's exact test were used to determine the relationship between variables and significance level.

In view of the purposeful and scientifically accepted approach in social sciences to objectively address the research objectives, it is appropriate to summarize against the background of objectives.

5.2 Objective 1: Factors that could determine adoption and non-adoption of agricultural technologies.

5.2.1 Independent variables.

Most of the respondents (61%) in this study were female, as such giving an assumption that most of the farmers in Botswana are female. The majority of female respondents (33%) fall within the age group 51 to 65 years of age, as compared to 23.2% male respondents. Most of the male respondents (39.3%) are over 65 years of age as against 18% of the female respondents. There were more literate respondents (61%) than illiterate (39%). A highly significant relationship (x^2 = 27.975; p= 0.000) occurs between gender and level of education, whereby females (78%) are significantly more literate than males (36%).

The field size for respondents ranged from 1 to 88 hectares of land, with the majority (72%) having 2 to 10 hectares of land. Most of the respondents aged 51 to over 65 years own land, while the few younger respondents who do not own land, use the fields of their parents. Most of the trained female respondents (57%) are members of farmer organizations as compared to few (49%) males. On the other hand 100% male respondents from the control group are not members of any farmer organization, as against 13% females who are members. A significant relationship was found between age and land ownership namely, the older the respondent the more they own the land. Another significant relationship occurred between age and organizational membership, the older the respondents, the more they are members of the organization.

5.2.2 Intervening variables

The study established that 56 percent of respondents were to a great extent determined to try out ideas after training; this concludes that they had interest in the courses they attended. It was further confirmed by 61 percent of respondents

who are implementing the acquired knowledge. Female respondents (57%) more readily adopt technology than their male counter parts (43%).

According to the results, 39 percent of the respondents were not implementing the acquired knowledge due to various reasons. The main reason indicated was lack of resources, which include capital, water, labour, farming implements and others. These results confirm the hypothesis that poor impact of training on farmers' production efficiency is a result of not implementing the acquired knowledge.

Most of the trained respondents 85 percent and 90 percent of the control group consider themselves as subsistence farmers, only five percent of trained respondents regard themselves as commercial farmers. According to their aspirations in five years only 45 percent trained respondents consider themselves to be still subsistence farmers, while 35 percent aspire to be commercial farmers. In the control group the majority namely 76 percent still consider themselves at a subsistence level and having no aspiration to improve.

The results indicated clearly that the younger the respondents, the more they aspire to be commercial farmers. Only five percent of the respondents in the age group <=35 perceive themselves as farming on a commercial level while 60 percent indicated that they aspire to become commercial farmers. The conclusion is that even where the level of implementation of the knowledge is low, the fact that farmers were exposed to new technology broadens their vision for brighter future.

The education status of respondents concludes that both illiterate and literate respondents consider themselves as subsistence farmers; only eight percent of literate respondents perceive themselves to be commercial farmers. With regard to their aspirations in five years time 32 percent of the illiterate and 36 percent of the literate respondents aspire to become commercial farmers.

A significant relationship (f = 10.24; p = 0.022) was found between field size and farmers perception of the level of farming. The larger the field size, the more the respondents perceive themselves to be either emerging or commercial farmers.

With regard to needs or expectations of farmers, all respondents in the study felt that government should continue to provide farmer-training courses, and 59 percent of the trained respondents agreed that extension agents did visit them after training. The study also revealed that the number of farmers allocated per extension agent is unmanageable, i.e. too many to be served by one officer. The implication is that farmers will not be advised properly if the extension agent cannot manage to visit them regularly.

In relation to the content of the courses, the study revealed that courses are too theoretical (Table 4.14). The results were confirmed in Table 4.15, where it was established that the time allocated per course is too little. This means that instructors do not have enough time to do the practical part with trainees, hence the courses being theoretical. The implication is that the duration of courses should be extended.

Literature reveals that the most important function of extension will always remain the identification of needs (felt and unfelt needs) according to which development are to be planned, initiated and updated. In this study, 73 percent of extension agents indicated that they talk to individual farmers in assessing their needs.

The study established that most of the extension staff associates non-adoption of technologies to the fact that training of farmers is offered free. The majority of extension staff interviewed in this study, 53% extension agents, 60% instructors and the two managers agreed that farmers should pay to attend training courses (Figure: 4.6). The practical implication is that payment will encourage commitment, adoption / implementation and seriousness, i.e. only committed and dedicated farmers will pay to attend courses.

5.3. Objective 2: Farmer's contribution to the development of the training programs and the criteria for selecting course participants.

As regard contribution to the development training programs, 65 percent of trained respondents indicated that they were never involved in identifying the courses they attended; while only 11 percent indicated that they were involved every year. A total of 80 percent of the trained farmers' perception is that the extension agents were responsible for identifying the training courses they attended. This concludes that the approach is top-down and directive, and it neglects one of the basic extension principle namely, full participation by all role players. The extension agents consider only the unfelt needs of respondents, but not the felt needs.

The practical implication is to reverse the approach, for training to have an effect. These results support the hypothesis that the training offered did not address the intervening variables for respondents. In contrary to the farmers' response, the extension agents (43%) and support staff (67%) indicated that farmers are only to a fair extent involved in identifying the courses they attend. This again shows that farmers are not fully involved. The study also established that extension staff selects interested farmers and farmers with projects to attend courses.

5.4. Objective 3. Impact of the knowledge gained from the training program on the farming practices of the trainees

The results of the study indicated that 36 percent of the respondents indicated that training did not have any impact at all on their production efficiency, 45 percent indicated a moderate impact, while only 19 percent indicated a positive impact.

According to the study 48 percent of trained respondents indicated that the knowledge gained from training was very useful. Thirty-six percent of respondents indicated that they have never used the knowledge; while 46 percent of them revealed that they used the knowledge often. The practical implication however is that the result of using the knowledge is not reflected on their production efficiency.

The aspect of no impact at all on the production efficiency indicated by 36 percent trained respondents was supported by the fact that 47 percent respondents of the control group, indicated that their production efficiency is the same as for trained farmers.
The extension staff indicated that when they make follow-ups on trained farmers, the status of acquired knowledge is usually negative. Respondents do not implement what they have learnt, and this could be due to shortage of resources and resistance to change. This concludes that courses offered at DRTC are not effective in assisting farmers. The results support the hypothesis that the poor impact of training on farmers' production efficiency is because of the non-implementation of technologies due to lack of resources.

In conclusion the study established that the intervening variables are the most important and crucial variables in behaviour analysis, especially if compared to the limited influence of the independent variables. These findings conclude that for training to be effective and to have an impact on respondents' production efficiency, extension has to address the needs and perception of the trainees.

The results of the study provide evidence that non-adoption of technologies was influenced by the intervening variables, for example 48 percent of the respondents (Table 4.24) indicated that knowledge gained from training is very important, but failed to implement the knowledge in their production efficiency. The study also concluded that the acquired knowledge was incompatible with the situation of the respondents. This information supports the hypothesis that poor

impact of training on farmers' production efficiency is a result of non-adoption of technologies.

The study has shown how important and prominent the needs and perception of trainees are in adoption behaviour. It was established that if the respondents did not realize a need to change, regardless of how important the technology is, negative forces will always impede adoption.

Generally, the study provided clear evidence in support of Tolman (1967) and Düvel's (1975) behaviour analysis and intervention model, which provides the conceptual framework and theoretical foundation for this study. Since this study is the second of this kind, from what Sebina (2002) has done in Botswana based on this model, it is believed that it has paved the way for similar research, to compliment the two.

Lastly, the study has established that there is a strong relationship between adoption behaviour and production efficiency of farmers in the study area. Simply put, this study has shown that the needs of respondents determine adoption behaviour, which finally influences production efficiency. The respondents in this study indicated that they want to attend training, but implementation and how to measure the impact of training still points to a need for further research.

5.5 **Recommendations**

Since research is not an end in itself, but rather a means of improving the current situation, it is appropriate to propose recommendations based on the findings of this study.

5.5.1 Action Recommendations

The study established that most of the respondents were female who are younger in age than their male counterparts; as such training should target young female participants.

Training opportunities for female participants should be increased, since they are more responsive to technology adoption than their male counter parts.

The majority of respondents fall within the age group 51 to 65 years of age, and it is this category that indicated high percentage of illiteracy. It is recommended that teaching methods should be changed to suit the age of respondents, for example on-farm training and demonstrations that are more practical instead of lecturing in the classroom.

Since young farmers do not own land, but they use the land for parents and work with them, it is recommended that the use of land should be passed on to their children, and the terms of land ownership should be addressed to make it easier for them to get land.

In view of the findings that most of the respondents are not members of farmers' organizations, this makes it difficult for them to get resources and support services. It is recommended to develop the institutional capacity of farmer organizations; that will assist them in voicing up their problems as groups and as such have an influence on policies.

The study revealed that 39 percent of the respondents are not implementing the acquired knowledge due to various reasons. It is recommended that extension should set up systems of how to involve participants when planning and suggesting the training courses in order to address their needs and objectives. It

is also recommended that the department should facilitate formation of farmer field schools, where farmers could indicate what their needs are.

Training should capitalize on interested young farmers who perceive themselves as commercial farmers for the future

Since field size is found to be positively related with adoption, it is recommended that where possible and applicable farmers should be allocated more land as it acts as an incentive to technology adoption.

The issue of extension agent: farmer ratio should be considered by the department, and the appropriate manageable number of farming families be allocated to each extension agent.

The study revealed that courses are too theoretical due to little time allocated per course; as such the duration of courses should be extended, to give instructors enough time for practical.

Since most of the trainees are subsistence farmers, it is recommended that training costs should be shared between farmers and the Department of Crop Production and Forestry to induce commitment and seriousness on trainees, and also to identify the appropriate farmers for each course.

The study revealed that farmers are recruited for courses that have been identified already by the extension agent, the appropriate procedure would be to identify farmers' needs and objectives with them and then schedule courses.

Before training is conducted, it is necessary to have a measurement or quantitative indications of the objective levels of efficiency or knowledge base of participants. This will assist during evaluation to show if training had impact or not.

The Department of Crop Production and Forestry should reduce the number of training courses per annum, since most of them are not targeted.

Clear mechanisms of how to evaluate the impact of training should be established for each course, and evaluation should be compulsory.

The curriculum or technologies taught farmers at DRTC should be reviewed. Consider the content of the course and the level of understanding for participants.

Since this study is an eye opener to the department, it should be used to strategize training of farmers at DRTC.

Availability of resources to farmers should take precedence before training is offered.

DRTC instructors should be trained on how to teach adults.

5.5.2 Future Research Recommendations

Since this study was done in one region, it would be necessary to extend it to other regions. A study should be conducted to find out why female respondents adopt technology more readily than their male counter parts.

It is recommended that future research should focus on intervening and dependent variables to address the issue of non-implementation of skills and knowledge.

It is also recommended that future studies should consider what knowledge is frequently used and its relevancy to the needs of farmers.

An evaluation needs to be done on Botswana's extension system of technology transfer, to find out how effective it is in disseminating appropriate and useful extension messages.

REFERENCES

ABD-ELLA, M.M, HOIBERG, E.O, & WARREN, R.D, 1981. *Adoption Behaviour in family farm systems:* Lowa study. Rural Sociology. Vol. 46, No.1: 42-61

ALENE, A.D, POONYTH, D, & HASSAN, R.M, 2000. *Determinants of Adoption and Intensity of use of improved maize varieties in the Central highlands of Ethiopia;* Agrekon, Vol.39, No, 4: 633-643.

ATKINSON, R.L, ATKINSON, R.C, SMITH, E.E, & HILGARD, E.R, 1985. *Introduction to Psychology*, 9th Ed, New York: Harcourt, Brace Javonorich. PP. 181-207.

BAKER, H, 1987. *The program Planning Process*. In Blackburn, D. Extension Handbook, Guelph, Canada.

BEMBRIDGE, T.J. 1991. *The practice of agricultural extension*. A training manual. Development Bank of South Africa. Halfway House.

BEMBRIDGE, T.J, 1992. *Characteristics and Adoption of Avocado growing practices by small-scale growers in Venda*. South African journal of agric. Extension. Vol 21:8-13. Pretoria, S.A.

BEMBRIDGE, T.J, & WILLIAMS, J.L.H, 1990. *Factors affecting adoption of maize growing practices in small-scale farmer support programs*. South African journal of agric. Extension, 53-61. Pretoria, S.A.

BENDER, C.J.G, 2001. *Adult learning education and training in building communities from the grassroots.* Community development Academy, training manual.

BERELSON, B, & STEINER, G.A, 1964. *Human Behaviour*: An Inventory of Scientific Findings. New York: Harcourt, Brace & World, Inc. PP. 86-121.

BIZIMANA, C, NIEUWOUDT, W.L, & FERRER, S.R.D, 2002. *Factors influencing adoption of recommended farm practices by coffee farmers in Butare Southern Rwanda*. Agrekon, Vol. 41, No.3: 237-248.

BOTHA, C.A.J, & LOMBARD, P.P, 1991. *Influence of Experience, Education and Training on farming related behaviour of commercial project farmers*. South African journal of agric. Extension. Vol.20: 36-44. Pretoria, S.A.

BOYLE, P.G, 1981. *Planning Better Programs*. Adult education Association professional development series, 143-159

BRACKHAUS, B. (undated). *Needs assessment in adult education*: Its problems and prospects. Adult education forum, 233-239.

BROWN, L.A, MALECKI, E.J, & SPECTOR, A.N, 1976. *Adopter Categories in a Spatial Context*: Alternative explanations for an empirical regularity. Rural Sociology. Vol. 41, No. 1: 98-116.

CHAMBERS, R, 1983. *Rural Development*. Putting the last first. New York, USA.

CLARK, R, & TIMMS, J, 2000. *Continuous Improvement and Innovation*. The better practice process. The Rural extension centre, Gatton.

COOP, J.H, 1958. *Toward Generalization in farm practice research*. Rural Sociology. Vol. 23, No.2: 102-120

DE BEER, L, 2000. *The specialist or generalist: What does the year 2000 and beyond require for sustainable agricultural development*. Proceedings of the 34th Conference of South African Society for Agricultural Extension, Pretoria, South Africa.

DEKLERK, C.H & DÜVEL, G.H, 1982. *Human and Environment Influences in Practice Adoption and Reproduction Efficiency in High Potential Cattle farming Areas of South Africa*. South African journal of agric. Extension, 11: 1-15

DUTOIT, A.P.N & ZWANE, E.M. 2001. *An outcomes – based approach to in-service training of extension officers*. Proceedings of the 35th Conference of South African Society for Agricultural Extension, Pretoria, South Africa.

DÜVEL G.H, 1975. *The Mediating Function of Perception in Decision-Making*. South African journal of agric. Extension, 4:25-36, Pretoria, S.A.

DÜVEL, G.H, 1982. *Need Creation and Exploitation*. The Bases for change. South African journal of agric. Extension, 11: 27-33. Pretoria, S.A.

DÜVEL, G.H, & SCOLTZ, H.P.J, 1986. *The Non-Acceptability of Recommended Veld Management Practices.* South African journal of agric. Extension, 15: 1-10, Pretoria, S.A.

DÜVEL, G.H. 1987. *Situation determination: From theory to practical model*. South African journal of agric. Extension, 16: 1-10. Pretoria S.A.

DÜVEL, G.H. 1991. *Towards a model for the promotion of complex innovations through programmed extension*. South African journal of agric. Extension, 20:70-86. Pretoria, S.A.

DÜVEL, G.H. 1995. *Resistance against stock reduction: A cognitive field analysis*. South African journal of agric. Extension, 24: 45-60. Pretoria, S.A.

DÜVEL, G.H, & BOTHA, A.J, 1999. *Human Constraints to Sustainable Agriculture in the arid Regions of South Africa*. The journal of agricultural education and extension, Vol. 6, No.1: 47-60

ELIAS, Z, 1999. *The Ethiopian Extension package Program*; Its Effect on farmers' perception and adoption of wheat and teff production technologies. A PhD Thesis University of Agricultural Sciences, Banglalore.

FAO REPORT, 1971. Botswana Soil Classification Project, Gaborone, Botswana.

FIELD, S. 2001. *Innovation Approaches* World Wide Web http://dbtindia.nic.in/farm/page2/.htm

FOLTZ, J.D, & CHANG, H.H, 2002. *The adoption and profitability of rbst on Connecticut dairy farms*. American Journal of Agricultural Economics. Vol.84, No.4: 1021-1032

FREIRE, P, 1970. *Pedagogy of the oppressed*. The free press – New York.

FREMY, J. 2000. *Ten years of training for agricultural extension in Sub-Saharan Africa* (1987-1998). Proceedings of the 34th Conference of South African Society for Agricultural Extension, Pretoria, South Africa.

GETAHUN, D, MUANGI, W, VERKUIJI, H, & ABDISEKUR, W, 2000. *An Assessment of the Adoption of Seed and Fertilizer packages and the role of credit in small-holder maize production in Sidama and North Omo Zones*, Ethiopia.

GORFE, H.A, 2004. *The Comparative Influence of Intervening Variables in the Adoption of Maize and dairy farmers in Shashemene and Debrezeit*, Ethiopia. Pretoria, S.A.

HOPE, A, & TIMMEL, S, 1990. *Training for Transformation*. A hand book for community workers. Roots of the method. Mambo press, Gweru, Zimbabwe.

HORTON, D. BALLANTYNE, P. PETERSON, W. URIBE, B. GAPASIN, D. & SHERIDAN, K. 1993. *Monitoring and Evaluating Agricultural Research*.

JOHNSON D.E, MILLER L.R, MILLER L.C, & SUMMERS G.F, 1987. *Needs Assessment*: Theory and Methods. Iowa University Press, Iowa, USA

KAUFMAN, R, 1983. *A Holistic-planning model*. Performance and instructional journal, 22(8), 1-15.

KAUZENI, A.S, 1989. *Effective Extension Service*: The Tanzanian Experience. Swala Publishers Dar es salaam.

KEREGERO K.J.B, 1991. *Foundations of Extension Practice in Tanzania*. Journal of continuing education and extension, 1: 1-15

KOCH, B.H, 1986. *Perception Analysis as Guideline in Agricultural Extension*. South African Journal of Agricultural Extension. 15:19-24. Pretoria, S.A.

KOCH, B.H, 1986. The Role of Knowledge in Adoption of Agricultural Development practices. South African Journal of Agricultural Extension, 14:11-16. Pretoria, S.A.

KOCH, B.H, 1987. *Problem Perception as a Precondition of Behaviour Change*. South African Journal of Agricultural Extension. 16: 19-25. Pretoria, S.A.

Lewin K, 1951. *Field Theory in Social Science*. Selected theoretical papers. New York: Harper & Row.

MARINCOWITZ, G.J.O, & DÜVEL, G.H, 1987. *The Role of Needs in the Adoption and Promotion of Boer Goat farming.* South African Journal of Agricultural Extension, 16: 11-18.

MENSAH, S.A, & SEEPERSAD, J, 1992. *Factors Influencing the adoption of recommended practices by Cocoa farmers in Ghana.* Journal of Extension systems. Vol.8, No,1: 44-67

MONTSHO, C.B. 2002. The impact of Horticulture training. Gaborone, Botswana.

MWANGI, J.G. & RUTATORA, D.F. 2002. *Are needs assessments in extension programs rationally objective or mostly political*? South African Journal of Agricultural Extension, 31:30-38.

NEEL, S.M.F, 1977. *Theories of Psychology*. Massachusetts: Schenkman Publishing Company.

OLIVIER, C, 2000. *Let's Educate, Train, & learn out-comes based*. Design books Clubview.

OMOTAYO, A.M, ATALA, T.K, & OGUNWALE, S.A, 1996. *Animal Traction ownership and utilization in Nigeria*. Journal of Extension systems. Vol.12, No.1: 91-107

OMOTAYO, A.M, CHIKWENDU, D.O, ZARIA, M.B, YUSUF, J.O, & OMENESA, Z.E, 1997. *Effectiveness of Radio in Nigeria in dissemination of information on improved farming practices*. Journal of Extension Systems. Vol. 12, No.1: 91-107.

OPARE, K.D, 1977. *The Role of Agricultural Extension in the adoption of innovations by Cocoa growers in Ghana*. Rural Sociology. Vol.8, No,1: 44-67.

RICHARDSON, J.G. 1999. *Accountability of extension education in the global arena*. South African Journal of Agricultural Extension, 28:45-61.

ROGERS, E.M, 1983. *Diffusion of Innovations*, 3rd Ed. New York: The Free Press.

RUTATORA, D.F, & MATTEE, A.Z, 2001. *Towards a farmer centered extension service*: The case of Ulunguru Mountain Agricultural Development Project, Morogoro Tanzania. South African Journal of Agricultural Extension, 30:89-103.

SEBINA, N.V. 2002. *Acceptability and influence of rangeland fencing in southern region of Botswana*. Pretoria, South Africa.

SMITH, M.E. 1994. *Evaluating management development*, Training and Education. Hampshire, England.

South African Regional Commission for the Conservation and Utilization of the Soil Report, 1971. Pretoria, South Africa.

TAHAL CONSULTING ENGINEERS, 2000. National Master Plan for Agricultural Development. Gaborone, Botswana.

TAYLOR-POWELL, E, STEEL, S.E, & DOUGLAH, M, 1996. *Planning and Programme evaluation*. Wisconsin, U.S.A

TOLMAN, E.C, 1967. *A Psychological Model*. Towards a General Theory of Action. Harvard University Press.

TREUNICHT, S.P. STEYN, G.J. & LOOTS, G.M. 2001. *Participatory learning and action (PLA):* Sharing the South African experience: A discussion of key issues. South African Journal of Agricultural Extension, 30:115-124

WAKE, J.L, KIKER, C.F, & HILDERBRAND, P.E, 1988. *Systematic Learning of Agricultural Technologies.* Agricultural systems, 27:179-193.

WITKIN, B.R, 1984. *Assessing needs in educational and social programs*. San Francisco: Jossey-Bases

XABA, G.O, 2002. *An Investigation on how information campaign on liming and conservation tillage was managed and received in the Mlondozi landcare project*. Pretoria, South Africa.

ZEGEYE, T, TADESSE, B, & TESFAYE, S, 2001. *Adoption of High Yielding Maize Technologies in major, maize growing regions of Ethiopia.* Ethiopian Agricultural Research organization. Research Report No. 41.

ZEGEYE, T, & TESFAYE, S, 2001. *Determinants of Adoption of Maize Technologies and inorganic fertilizer in Southern Ethiopia*. Ethiopian Agricultural Research Organization. Research Report No. 39.

APPENDIX A

EVALUATION QUESTIONNAIRE FOR TRAINED FARMERS

A. Independent Variables

Respondent name (No)..... ☐ V1

Name of Interviewer..... ☐ V2

District:

Kgatleng	1	☐ V3
South East	2	
Kweneng South	3	
Kweneng North	4	
Kweneng West	5	

Sex

Male	1	☐ V4
Female	2	

1. What is your age? ..... Years ☐ V5

2. What level of education did you attain? ☐ V6

No education	1
Sub A – Sub B	2
Standard 1 – 7	3
Form 1 – 3	4
Form 4 – 5	5

3. How long have you been farming ☐

1 – 5 years	1	V7
6 – 10 years	2	
> 10 years	3	

4. How big is your field or farm ☐ V8

5. Do you own this field?

Yes = 1 ☐ V9

No = 2

6. If no, please explain the land system?

_____

_____

7. If you need advice to overcome a problem whom do you contact

Your extension agent	1	☐ V10
Support staff	2	
D.A.O	3	
Others	4	

8. How do you contact the officer when you need information?

Telephone	1	☐ V11
Letter	2	
Contact him at the office	3	

9. Are you a member of any organization?

Yes = 1 ☐ V12

No = 2

10. If yes, how often do you meet? ☐ V13

B. Intervening Variables

Need

11. How often do you attend farmer-training courses in a year?

V14

12. To what extent did you participate in identification of the courses you attended?

Never	1	V15
Few occasions	2	
Every year or regularly	3	

13. If you did not participate who suggested the courses?

Don't know	1	
Others	2	V16
Extension agent	3	
Farmers committee	4	

14. Did you have interest in the courses you attended?

Not at all	1	V17
To a slight extent	2	
To a great extent	3	

15. Explain your answer in terms of 2 & 3 above

_____

_____

_____

16. To what extent were you determined to try out ideas presented during

the course?

Not at all	1	☐ V18
To a slight extent	2	
To a great extent	3	

17. If you did not have interest why did you attend?

_____

_____

18. If your answer above is 2 or 3 explain what you did?

_____

_____

_____

_____

19. Where would you consider yourself at present?

Subsistence farmer	1	☐ V19
Emerging farmer	2	
Commercial farmer	3	

20. Where would you like to see your self in five years time?

Subsistence farmer	1	☐ V20
Emerging farmer	2	
Commercial farmer	3	

21. Did the courses you attended meet your needs or expectations?

Not at all	
Yes to some extent	☐ V21
Yes to a great extent	

22. Evaluate to what extent did the courses you attended meet your needs

or expectations on a scale of 1 - 10

Not at All To a great Extent ☐ V22

1 2 3 4 5 6 7 8 9 10

23. If your needs were not met what should be done?

_____

_____

_____

24. To what extent did the training courses had impact on your production efficiency?

No impact at all	1	☐ V23
Moderate impact	2	
Positive impact	3	

25. Explain your answer in terms of production or financial effect?

_____

_____

_____

26. Do you know any of your neighbours who attended a course?

Yes = 1
No = 2

☐ V24

27. If yes, to what extent did the training help him/her improve his/her production efficiency?

Not at All — Improve a Lot

1 2 3 4 5 6 7 8 9 10

☐ V25

Perception

28. How do you perceive the instructor who presented the course?

Unsuccessful	1
Successful	2
Very successful	3

☐ V26

29. On a scale of 1 – 10 rate the instructor who presented the course?

Unsuccessful — Very successful

1 2 3 4 5 6 7 8 9 10

☐ V27

Knowledge

30. When was the last time that you attended a training course?

☐ V28

31. What was the course about; can you name three aspects of it?

_____

_____

_____

32. How useful is the knowledge of that course for your situation?

Not useful	1	☐ V29
Quite useful	2	
Very useful	3	

33. On a scale of 1 – 10 rate the usefulness of this course to your situation

Not useful	Very useful	☐ V30
1 2 3 4 5 6 7 8 9 10		

34. Have you used the knowledge from this course since you were trained?

Never	1	☐ 31
Seldom	2	
Often	3	

35. Have you had any difficulty in applying the knowledge?

At first	1	☐ V32
Still	2	
No	3	

36. What kind of difficulty did you experience if any?

_____

_____

_____

C. Dependent Variables

37. Does the extension agent usually come and talk to you about what you learned at the course?

Yes = 1
No = 2

[ ] V33

38. If not, do you usually contact him after you have been trained?

_____

_____

_____

39. How many times does your extension agent visit you in a month?

[ ] 34

40. Would you say the number of farmers covered by your extension agent is?

Sufficient / Manageable	4	☐ V35
Not sufficient / too few	3	
Unmanageable / too many	2	
Don't know	1	

41. On a scale of 1 – 10 rate the services of your extension agent

Totally dissatisfied Absolutely satisfied ☐ V36

1 2 3 4 5 6 7 8 9 10

42. Would you say the courses attended at rural training center are?

Too theoretical	1	☐ V37
Too practical	2	
Well-balanced	3	

43. What is your feeling about the time allocated per course at rural training centre

Too little	1	☐ V38
Too much	2	
Don't know	3	
Sufficient	4	

44. Should government continue to provide farmer-training courses?

No	1	
Don't know	2	☐ V39
Yes	3	

45. What procedure according to your knowledge or experience should the government use to successfully implement farmer-training courses?

_____

_____

_____

APPENDIX B

EVALUATION QESTIONNAIRE FOR THE CONTROL GROUP

FARMERS WHO HAVE NEVER BEEN TRAINED

A. INDEPENDENT VARIABLES

Respondent Name (No) ---------- ☐ V1

Name of Interviewer ---------- ☐ V2

Sex

Male 1	
Female 2	

☐ V3

1. What is your age? --------Years ☐ V4

2. What level of education did you attain?

No education	1
Sub A - Sub B	2
Standard 1 – 7	3
Form 1 – 3	4
Form 4 – 5	5

☐ V5

3. How long have you been farming?

1-5 years	(1)	☐ V6
6-10 years	(2)	
> 10 years	(3)	

4. How big is your field or farm? ☐ V7

5. Do you own this field or farm?

Yes = 1

No = 2 ☐ V8

6. If no, please explain the land system?

_____

_____

7. If you need advice / information to overcome a farming problem whom do contact?

Your extension agent	(1)	☐ V9
Support staff	(2)	
D.A.O	(3)	
Others	(4)	

8. How do you contact the officer when you need information?

Telephone	(1)	V10
Letter	(2)	
Contact him at the office	(3)	

9. Are you a member of any farmer organization?

Yes	(1)	
No	(2)	V11

10. If yes, how often do you meet? V12

B. INTERVENING VARIABLES

Need

11. Have you ever attended any course offered by your extension agent? (Agricultural Demonstrator)

Yes = 1
No = 2

V13

12. Why have you never attended any course?

_____

_____

_____

13. Where would you consider your self at present?

Subsistence farmer	(1)	☐ V14
Emerging farmer	(2)	
Commercial farmer	(3)	

14. Where would you like to see your self in five years time?

Subsistence farmer	(1)	☐ V15
Emerging farmer	(2)	
Commercial farmer	(3)	

15. Do you know any of your neighbours who have attended courses?

Yes = 1 ☐ V16
No = 2

16. Do you think their production efficiency is better than yours?

Yes = 1 ☐ V17
No = 2

17. If no, why do you think they are not doing better than you?

_____

_____

_____

18. How would you regard your production efficiency compared to trained farmers?

Don't know	1	☐ V18
Less efficient	2	
Same as them	3	
More efficient	4	

C. DEPENDENT VARIABLES

19. How many times does your extension agent visit you in a month?

☐ V19

20. Would you say the number of farmers covered by your extension agent is?

Sufficient / manageable	(4)	☐ V20
Not sufficient / too few	(3)	
Unmanageable / too many	(2)	
Don't know	(1)	

21. How would you rate the services of your extension agent on a scale of 1 – 10 below

Totally dissatisfied **Absolutely satisfied** ☐ V21

1 2 3 4 5 6 7 8 9 10

22. In your own opinion, do you think training of farmers is important?

Yes = 1
No = 2

☐ V22

23. If yes or no, please explain your answer?

_____

_____

_____

APPENDIX C

EVALUATION QUESTIONNAIRE FOR EXTENSION AGENTS

Respondent Name (No) …… ☐ V1

1. How do you assess the farmers' needs in your extension area?

Talk to individual farmers	(3)	☐ V2
Address the farmers committee	(2)	
Talk to leaders	(1)	

2. What criteria do you use to identify courses for the farmers?

Suggest courses by yourself	(1)	☐ V3
Address the farmers committee	(2)	
Do individual visits to farmers	(3)	

3. After how long do you visit farmers who have just been trained?

< 10 days	(4)	☐ V4
11 – 20 days	(3)	
21 – 30 days	(2)	
> 30 days	(1)	

4. If you do visit farmers, what is usually the status of implementation for the new acquired knowledge or technology?

Positive	(1)	☐ V5
Negative	(2)	

5. If negative, what are usually the reasons for non-practice or non-implementation of the acquired knowledge?

_____

_____

_____

6. On a 10-point scale below evaluate the capability of instructors at Rural Training centre.

Not Capable **Very Capable** ☐ V6

1 2 3 4 5 6 7 8 9 10

7. If your answer above is below 7, what should be done to improve the situation?

_____

_____

_____

8. Which of the following is the best method to select course participants?

Farmers with projects	(4)	☐ V7
Interested farmers	(3)	
Both 3 & 4	(2)	
Others	(1)	

9. If your answer above is three, how do you identify interested farmers?

_____

_____

_____

10. To what extent are farmers involved in the identification of their training courses?

Not involved at all	(1)	☐ V8
To a less extent	(2)	
To a fair extent	(3)	
Fully involved	(4)	

11. On a 10 point scale below rate the involvement of farmers in identifying their training courses.

Not Involved at All **Fully Involved** ☐ V9

1 2 3 4 5 6 7 8 9 10

12. On the same scale to what extent do you think farmers should be involved in identifying their training courses?

Not Involved at All **Fully Involved** ☐ V10

1 2 3 4 5 6 7 8 9 10

13. To what extent do you think courses offered at Rural Training Centre are effective in assisting the farmers?

Not effective at all	(1)	☐ V11
To a less extent	(2)	
To a fair extent	(3)	
Very effective	(4)	

14. Please explain your answer for question 13 above?

_____

_____

_____

15. As an extension agent what is your feeling about the duration of courses at the Rural Training Centre, is it:

Too short	(1)	☐ V12
Too long	(2)	
Sufficient	(3)	

16. In your opinion how are the courses offered at RTC, are they:

Too theoretical	(1)	☐ V13
Too practical	(2)	
Well balanced	(3)	

17. To what extent did farmers who attended training courses contact you for further support after training?

Not at all	(1)	☐ V14
Don't no (can't re-call)	(2)	
To a slight extent	(3)	
To a fair extent	(4)	
To a great extent	(5)	

18. Please explain your answer for question 17 above by giving a possible reason for the farmers' reaction?

_____

_____

_____

19. What is your feeling about the number of farmers you serve, is the number:

Sufficient / manageable	(4)	☐ V15
Not sufficient / few	(3)	
Unmanageable / too many	(2)	
Don't know	(1)	

20. Should the government continue to provide farmer – training courses?

Yes = 1
No = 2

☐ V16

21. If no, please explain your answer?

_____

_____

_____

22. Do you think farmers should pay to attend farmer-training courses?

Yes = 1
No = 2

☐ V17

23. If yes or no please explain your answer?

_____

_____

_____

APPENDIX D

EVALUATION QUESTIONNAIRE FOR SUPPORT STAFF

Respondent Name (No)…… ☐ V1

1. After how long do you visit farmers who have just been trained?

< 10 days	(1)	☐ V2
11 – 20 days	(2)	
21 – 30 days	(3)	
> 30 days	(4)	

2. If you do visit farmers, what is usually the status of implementation for the new acquired knowledge or technology

Positive	(1)	☐ V3
Negative	(2)	

3. If negative, what are usually the reasons for non-practice or non-implementation of the acquired knowledge?

_____

_____

_____

4. On a 10-point scale below evaluate the capability of instructors at Rural Training Centre.

Not Capable **Very Capable** ☐ V4

1 2 3 4 5 6 7 8 9 10

5. If your answer above is below 7, what should be done to improve the situation?

_____

_____

_____

6. Do all courses have a well-established program per course for teaching different levels of farmers at Rural Training Centres?

Yes = 1 ☐ V5
No = 2

7. If not, does that have an effect on the relevancy of the material to be presented to the farmers?

Yes = 1 ☐ V6
No = 2

8. If Yes or No, please explain your answer?

_____

_____

_____

9. Which of the following is the best method to select course participants?

Interested farmers	(1)	☐ V7
Farmers with projects	(2)	
Both 1 & 2	(3)	
Others	(4)	

10. If your answer above is one, how do you identify interested farmers?

_____

_____

_____

11. To what extent are farmers involved in the identification of their training courses?

Not involved at all	(1)	☐ V8
To a less extent	(2)	
To a fair extent	(3)	
Fully involved	(4)	

12. On a 10 point scale below rate the involvement of farmers in identifying their training courses.

Not Involved at All **Fully Involved** ☐ V9

1 2 3 4 5 6 7 8 9 10

13. On the same scale to what extent do you think farmers should be involved in identifying their training courses?

Not Involved at All **Fully Involved** ☐ V10

1 2 3 4 5 6 7 8 9 10

14. To what extent do you think courses offered at Rural Training Centre are effective in assisting the farmers?

Not effective at all	(1)	☐ V11
To a less extent	(2)	
To a fair extent	(3)	
Very effective	(4)	

15. Please explain your answer for question 14 above?

_____

_____

_____

16. As support staff what is your feeling about the duration of courses at the Rural Training Centre, is it:

Too short	(1)	
Too long	(2)	☐ V12
Sufficient	(3)	

17. In your opinion how are the courses offered at RTC, are they:

Too theoretical	(1)	☐ V13
Too practical	(2)	
Well balanced	(3)	

18. To what extent did farmers who attended training courses contact you for further support after training?

Not at all	(1)	☐ V14
Don't no (can't re-call)	(2)	
To a slight extent	(3)	
To a fair extent	(4)	
To a great extent	(5)	

19. Please explain your answer for question 18 above by giving a possible reason for the farmers' reaction?

_____

_____

_____

20. Should government continue to provide farmer-training courses?

Yes = 1	☐ V15
No = 2	

21. If no, please explain your answer?

_____

_____

_____

22. Do you think farmers should pay to attend farmer-training courses?

Yes = 1
No = 2

[ ] V16

23. If yes or no please explain your answer?

_____

_____

_____

APPENDIX E

EVALUATION QUESTIONNAIRE FOR INSTRUCTORS

Respondent Name (No)…….... ☐ V1

1. Which of the following methods do you use to teach farmers?

    1. Lecture
    2. Discussion
    3. Both 1 & 2
    4. Others (specify)

☐ V2

_____

2. Have you been trained on how to teach or train farmers?

    Yes = 1
    No = 2

☐ V3

3. If the above answer is no, what should be done to improve the situation?

_____

_____

_____

4. After how long do you visit farmers who have just been trained?

< 10 days	(1)	☐ V4
11 – 20 days	(2)	
21 – 30 days	(3)	
> 30 days	(4)	

5. If you do visit farmers, what is usually the status of implementation for the new acquired knowledge or technology?

Positive	(1)	☐ V5
Negative	(2)	

6. If negative, what are usually the reasons for non-practice or non-implementation of the acquired knowledge?

_____

_____

_____

7. Do all courses have a well-established program per course for teaching different levels of farmers at Rural Training Centres?

Yes = 1 ☐ V6

No = 2

8. If not, does that have an effect on the relevancy of the material to be presented to the farmers?

Yes = 1
No = 2

☐ V7

9. If Yes or No, please explain your answer?

_____

_____

_____

10. As an instructor what is your feeling about the duration of courses at the Rural Training Centre, is it:

Too short	(1)	
Too long	(2)	☐ V8
Sufficient	(3)	

11. Are you able to cover all the material per course within the allocated time?

Yes = 1
No = 2

☐ V9

12. If not, what do you suggest?

_____

_____

_____

13. In your opinion how are the courses at RTC, are they:

Too theoretical	(1)	☐ V10
Too practical	(2)	
Well balanced	(3)	

14. Should government continue to provide farmer-training courses?

Yes = 1	
No = 2	☐ V11

15. If no, please explain your answer?

_____

_____

_____

16. Do you think farmers should pay to attend farmer-training courses?

Yes = 1	
No = 2	☐ V12

17. If yes or no please explain your answer?

_____

_____

_____

APPENDIX F

EVALUATION QUESTIONNAIRE FOR MANAGERS

Respondent name (No)…… ☐ V1

1. On a 10-point scale below evaluate the capability of instructors at rural training centre

   Not capable Very capable ☐ V2

   1 2 3 4 5 6 7 8 9 10

2. If your answer above is below 7, what should be done to improve the situation

   _____

   _____

   _____

3. Do all courses have a well-established program per course for teaching different levels of farmers at rural training centre?

   Yes = 1
   No = 2 ☐ V3

4. If not does that have an effect on the relevancy of the material to be presented to farmers

   Yes = 1
   No = 2 ☐ V4

5. If yes or No, please explain your answer

   _____

   _____

   _____

6. To what extent do you think courses offered at rural training centre are effective in assisting the farmers?

Not effective at all	1	☐ V5
To a less extent	2	
To a fair extent	3	
Very effective	4	

7. Please explain your answer for question 6 above

_____

_____

_____

8. Should government continue to provide farmer-training courses?

Yes = 1

No = 2 ☐ V6

9. If no, please explain your answer

_____

_____

_____

10. Do you think farmers should pay to attend farmer-training courses?

Yes = 1

No = 2 ☐ V7

11. If yes or no please explain your answer

_____

_____

_____