

CHAPTER 4 METHODOLOGY

4.1 Introduction

This chapter outlines the methodology adopted to investigate the various interacting groups of factors which determine the success of small-scale irrigation farmers. The choice of study area, orientation and planning of the survey, sources of information, questionnaire design, sampling and interviewing procedure and analysis of data are discussed in this chapter.

4.2 Orientation and planning

The planning of the study commenced in October 2000 and took two months to complete. A personal visit was made to the research area.

The purpose of this preparatory stage was to obtain a clear picture of the farming situation in the area selected. During this period, discussions were held with various government officials, irrigation farmers and all members involved in the development and management of the settlement.

At the same time a complete list was compiled from the local records of all landowners, which was for the selection of stratified sample representing twenty schemes in Nkomazi.

4.3 Sources of information

Following the orientation phase it was decided to use two basic sources via library research, which included a range of research, report articles in journals, and local sources.

Demographic information on individual farmers, such as age, size of farm, gender, communication and participation were not available and had to be obtained from the irrigation farmers themselves. Little was known about the personal and socio-psychological factors, which form an important aspect of this investigation.

4.4 Orientation of the research

Prior to the investigation, the research procedures and questionnaire used in the study were discussed with government official at all levels, members of the local farmer's association and more importantly the questionnaire was tested and enumerators were well briefed and trained.

4.5 Research objectives

1. A questionnaire method for the collection of data formed the basis of the study. The main objectives of the questionnaire were:
2. To develop measures of farming success and characterize respondents accordingly

3. To identify and measure various personal and environmental factors and establish their relationship with farming success under irrigation.
4. To develop a scale for the selection of potentially successful small-scale irrigation farmers.

4.6 Questionnaire design

The questionnaire provided the main body of information concerning the sugar cane farming in Nkomazi region of Mpumalanga.

Information was collected on the following aspects:

- _ Personal aspect of respondents
- _ Irrigation at Komatipoort and Malelane overview.
- _ Perception of respondents towards farm management
- _ Perception of institutional factors and their influence on the production
- _ Knowledge of respondents towards recommended agricultural practices

4.7 Sampling procedure

A complete list of landholders on the settlement was compiled from available information derived from local government officials. A stratified random sample size of twenty schemes was obtained, representing 80% of the total of twenty –fives schemes in Nkomazi, which comprises Komatipoort and Malelane. A total sample of 139 respondents of whom 104 farmers from Komatipoort and 35 farmers from Malelane cane supply representing a 10% stratified of the overall farming population.

Structured and semi-structured questions were used to measure the different independent variables with various responses.

Dichotomic questions were avoided, whilst a certain number of open-ended questions were included. The multiple-choice questions or closed questions were arranged in a logical sequence according to the problem conceptualisation.

4.8 Data analysis

In analysing data, use was made of frequency distribution with percentages. Pearson correlation and Chi-square test, in combination with frequency distribution were used as indicators of relationships between the various variables. Stepwise regression analysis was performed to determine the relative contribution of the independent variables to the indicators of agricultural development.

Data Management & Statistical Analysis (DMSA cc) using the SAS statistical package processed the data collected in this study.

4.8.1 *Statistical Analysis*

The statistical analysis in this section is design to:

- Determine through multiple regression analysis the independent variables that significantly contribute to the variance of farming success aspects of the small-scale farmers in Nkomazi.
- Establish the degree of correspondence (if at all) via correlation analyses between one set of dependent variables on the one hand and between a set of independent variables on the other.

4.8.1.1 *Regression analysis*

Regression analysis is a technique often used in exploratory fashion to look for an empirical relationship between one variable and a set of other variables. The relationship is often expressed in the form of:

$$Y_i = B_0 + B_j X_{ij} + E_i$$

An equation that predicts a response variable, Y_i (also called a dependent variable) from a function of regression variables, X_{ij} (called independent or predictor variable) and the Unknown E_i .

The parameters are estimated in such way that a measure of the fit is optimised, E_i is known as an error term.

4.8.1.2 *Procedures followed to determine the significance of variables towards farming success.*

Preliminary lists of variables were selected according to the formulated hypotheses for statistical significance, and logical interrelation by means of Pearson correlation and Chi-square analyses. The variables were grouped in three different classes: independent, mediating and dependent (results of behaviour or farming success) as presented in Table 4.1.

A variable was considered when it has shown a direct relation with the next class, which also showed a relation with farming success. There was also tested in correlation matrix; the variables showing lowest correlation with farming success were left out until the best fit was selected. The overall set of variables that interact as determining factors of behaviour are summarised in Table 4.1

Table 4.1 The interrelation between different variables

HUMAN (PSYCHOLOGICAL)		ECONOMIC-TECHNICAL	
Independent variables	Mediating variables	Dependent variables	
		Behaviour	Consequence of behaviour
Personal and Environmental	Knowledge	Adoption of practices	Efficiency:
	Needs	P ₁	Yield/tons/ farm and /hectare =
		.	
		.	
		.	Farming income
	Perceptions	P _x	

From this set of variables that interact as determining behaviour, a final list of variables that showed a continuous influence or relationship with farming success were selected through this process. The interrelation between these variables was eliminated by means of correlation matrix.

The final step was to group all the variables together to test the relation and to determine their R² (Square of the multiple correlation coefficient) towards Farming success.

The screening instrument is therefore scientifically and statistically founded and is based on the conventional extension theory. The instrument therefore, not only confirm the current theory but also consist of unique combination of quantifiable which include : personal, mediating and dependents.

Table 4.2 Interrelations between 3 quantifiable variables and farming success

Independent variables	Mediating variables	Dependent variables	Results of behaviour
Personal and Environmental factors	Knowledge Needs Perceptions	Behaviour	
$F(a)+B_{iv}$	$+ C_{MV}$	$+D_{DV} =$	$Y_{FS}(Farming Success)$

This following regression equation $Y_i = B_0 + B_j + X_{ij} + E_i$ was altered to :

$$Y_{FS} = B_1 X + B_2 X + E_i$$

In which case B_0 is removed from the equation in order to avoid rounding error and in such situation the line is likely to go through $X=0$ and $Y=0$, which implies that the line has got a zero intercept.

This procedure was applied in order to determine the best fit where by the statistical values or Low R^2 values obtained were left out and thus considered as meaningless. The statistical regression equation was hypothesised according to the following functional relation:

$$\text{To } Y_{FS} = f(a) + B_{IV} + C_{MV} + D_{DV} + E_i$$

Where Y = farming success (result of behaviour)

(a) $X/Y = 0$ (Zero intercept)

B_{IV} = independent variable (personal and environmental)

C_{MV} = Mediating variable

D_{DV} = Dependent variable

E_i = Unknown parameter (very difficult to discover since it changes for each observation Y