SAPFACT 1.0 - A COMPUTER PROGRAM FOR QUALITATIVE EVALUATION OF IRRIGATION FARMING

by

CT CROSBY

with contributions by

A Vaughan, I Schmidt and CP Crosby

REPORT TO THE WATER RESEARCH COMMISSION

on

The Pilot Project
"The Interdependent Factors which Determine the Viability of Irrigation Farming"

by

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EXECUTIVE SUMMARY

1. THE ORIGIN OF THE PROPOSAL

This pilot project, ***The interdependent factors which determine the viability of irrigation farming,*** was initially proposed by the researcher because, when he was, for a number of years, a member of the interdepartmental committee concerned with irrigation policy, he noticed that committee members instinctively felt that the human factor was lacking in the well-researched quantitative reports developed by task groups consisting of engineers, scientists and economists. Even though none of them ever consciously doubted the scientific merit of the reports or that recommendations were realistic and achievable, committee members constantly referred to personal experiences with farmers and their problems or to visits to family or friends farming in the area under consideration, before making decisions.

As such visits had often taken place many years before, and were limited in their extent, it became clear to the researcher that a broader base of "human factor" information would serve a valuable purpose. He proposed a pilot study to develop this information base and provide an important understanding of the complexities of irrigation farming. He specified that it should show, in particular, how there could still be many apparently successful irrigation farmers at a time when financial and economic evaluations for new and rehabilitated irrigation projects were predominately negative.

2. RESEARCH OBJECTIVES

When the proposal was submitted, it was felt that case studies could assist policy-makers and practitioners "in visualising and relating to the realities of the situation."

The basis of the study was to be the undertaking of in-depth surveys on farms in three regions. The data obtained was to be utilised to synthesize stratified profiles of **representative farms** which would be incorporated in case studies.

The survey was, however, to **include social and economic facets** and the inputs of specialists in undertaking open-ended investigations of this nature were to be obtained.

An inferred objective was to compile a reference manual that would provide policy-makers and practitioners with the information that is normally only available through first-hand contact with farming relatives or friends i.e. **"an in-law in each irrigation area!"**

It soon became clear, however, that the dream of a reference manual of this nature was not only unattainable, but also undesirable. There was, consequently, some revision to the research objectives.

3. THE EVOLUTION OF THE RESEARCH APPROACH AND THE REVISED OBJECTIVES

3.1 The evolution of the research approach

The social scientist supporting the team proposed that qualitative research (which was a new field to the research team), based on taped, semi-structured open-ended farmer interviews, be employed in preference to questionnaire surveys. It soon became apparent from the interviews that the "missing link" that the decision-makers had been instinctively seeking, was the farmer as individual and entrepreneur.

The technique of developing representative farms as originally proposed, has been successfully applied in technical and economic studies. However, individuality is submerged in the "representative farm" or "reference manual" approach and the objective of a better understanding of people and their motivations thus defeated.

It was found that a **technical specialist can apply qualitative methods,** provided he has the necessary aptitude and training to conduct a sympathetic and objective interview with the emphasis on listening. An open-ended discussion lasting an hour can reveal a great deal. Analysing and presenting the data is more difficult but **the application of qualitative methods to technical problems and situations by people not specifically qualified in the social sciences, is an exciting and viable innovation.**

3.2 The revised research objectives

An important facet of the revised research objectives is the assessment of ways of incorporating qualitative research techniques into the portfolio of technical specialists. The project aims to develop a practical system for analysing and presenting the data applicable to irrigation farmers. This would facilitate the proposed establishment of an extended information base for irrigation planning and development.

4. METHODOLOGY

4.1 Semi-structured interviews

The bulk of data gathering was by semi-structured interviews. Although qualitative research may not be statistical, it is still systematic and strives for internal validity. Therefore, before the interviews could be embarked on, a number of preliminary steps had to be taken.

The first step was to achieve a degree of consensus about the form and content of the proposed interviews. The second step was to draw up guidelines for the semi-structured interviews. The third step was to train the interviewers.

Interviews were conducted on the farm and took the form of a free-flowing general

discussion, with the starting point normally being determined by the farmer. The interviewers did not dominate and allowed the farmer to determine the general direction of the discussion. Gentle prompting and probing when necessary ensured that most of the information required was covered.

The objective was to gain broad insights into the attitudes of irrigation farmers, and the environment in which they were operating. "Upper third" farmers, who could be expected to be well informed, were, therefore, interviewed. The usable interviews transcribed were eight in Natal, eight along the Orange river below the Van der Kloof dam, eight in the Transvaal, five in the Western Cape and one in the OFS.

The semi-structured open-ended taped interview is a powerful method, but has its limitations as a research tool. The recording of interviews is essential, but not always easy or successful. The transcription of the interviews and organising of the data are time-consuming and require skill and experience. The method appears to be particularly suited to situations where a relatively limited number of in-depth interviews can make a major contribution to the knowledge base. The planning of the research and the training of the interviewers is important, because of the intensive nature of the technique.

A sample interview transcript is presented in Appendix C of this report.

4.2 Sondeo

A recognised procedure developed to cater for situations where coordinated interdisciplinary inputs are essential in order to solve specific problems, or produce development plans for an area, is the Sondeo approach.

The Sondeo technique is as applicable today in the RSA as it has been for the past ten years in Guatemala (where it was developed) and in other parts of the world. Like the semi-structured taped interviews, it is based on open-ended discussions with farmers and makes use of a multi-disciplinary team which concentrates on an area for a week. The Sondeo discussions differ from the semi-structured taped interview in that they are not recorded and subsequently transcribed. The output of the discussions is integrated and moderated in the course of team discussions.

The Sondeo approach encourages the production of a solution that meets the needs of a farmer, as seen by the farmer, and fulfils the criteria identified by the broad range of disciplines represented on the Sondeo investigating team.

Sondeo can extend the scope of the open-ended interviewing technique, while eliminating the problems with transcription and presentation. Consequently, the Sondeo's value in answering the questions raised in this pilot project, was assessed. There was some difficulty in finding sufficient and appropriate specialists who would be able and willing to participate in an experiment. The Central Branch of the SA Irrigation Institute (SABI) provided the opportunity through a Farmers' Day that was held in the Brits area at the end of August 1992 with the theme

"Irrigation in the drought". The organising committee put together a team of highly qualified professionals representing a wide range of disciplines and interests for an experimental Sondeo.

Some 40 farmers were interviewed in three days, covering the Brits, Krokodil River and Beestekraal areas. Both large and small farmers were represented as were the main crops — wheat, tobacco and vegetables.

The three days did not allow enough time to evolve a full development report, but the content and structure of the Farmers' Day was developed by consensus based on the interviews, and the observations made by the different specialists.

The practical application of the open-ended farmer interviews came as a revelation to the participants. The comment was made by a very experienced extension officer that it was almost unknown for farm visits to be made without a specific agenda. Usually the objective was either to "sell" a concept or a programme or to acquire specific information or statistics. Letting the farmer make the running, allowing him to talk about the questions he regarded as important, broke new ground.

Further details of the procedure and the results achieved are contained in Appendix A of the report.

5. RESULTS OF THE SURVEY

The utilisation and presentation of the information gathered during the survey created dilemmas. These were finally resolved by the development of the computer program SAPFACT, described in Chapter 5, which enables technical specialists, without specific training in the social sciences, to utilise open-ended interviews to augment their assessments of the individual farmers and groups of farmers that they are investigating or counselling.

5.1 *Perspectives*

The perspectives gained on those aspects of irrigation farming which are of direct importance to decision-makers, equipment suppliers, scientists and counsellors are summarised in Chapter 4 under the following headings:

- Irrigation Water Management
- Irrigation Methods and Equipment
- The Farmer and His Household
- The Farm Enterprise
- Management Style
- Financial Situation
- Labour
- Advisory Services
- Markets and Crops

5.2 Quotations

Appendix B augments these summaries by appropriate comments made by farmers, extracted from interview transcripts.

5.3 Profiles

Originally the intention was to develop farmer profiles which could be incorporated in case studies. Although the research approach has been revised, the Steering Committee requested that the development of draft profiles still receive attention, "as this could assist in digesting the vast amount of data, as well as being used in viability studies." Progress was made in drawing up profiles of individual farmers from the transcripts of the interviews, but general publication raised the problem of confidentiality. It is difficult to disguise the identity of the farmer interviewed, there are too many clues!

In addition, the development of profiles from qualitative data differs from that of the more statistically based quantitative research. SAPFACT has been used to develop ranking profiles from the qualitative data.

These profiles are presented in the form of a table and short explanatory notes for a selection of farmers evaluated. In addition, these profiles are utilised to "characterise" three of the areas in which interviews took place, namely:-

- Irrigation areas below the PK le Roux Dam (Chapter 7)
- Natal coastal areas (Chapter 8)
- General irrigation areas in the Transvaal (Chapter 9)

6. SAPFACT 1.0 – A COMPUTER PROGRAM FOR QUALITATIVE EVALUATION OF IRRIGATION FARMING

SAPFACT (**S**outhern **A**frican **P**rocedure for assessing farming **FACT**ors) was developed to mobilise the information gained in the course of the pilot project, and to promote the application of interview based qualitative research techniques by practitioners with a scientific and technical background and no formal training in the social sciences.

There are many factors that have an influence on irrigation farming and the establishment of objective priorities is not easy. Even the listing of the factors will be subjective, although there are certain clear cut items that have a major influence. SAPFACT 1.0 identifies six aspects important in assessing the situation, each aspect consisting of eight factors, giving 48 factors in total, as follows:

Irrigation management: Operation and maintenance of equipment, design and installation of equipment, annual water supply, regularity of water delivery, understanding of irrigation, attitude to water management, appropriateness of irrigation methods, scheduling practices.

Crop profit potential: Suitability of soils, suitability of climate, alternative crop possibilities, crop yields, production costs, gross margin potential, market and price risks, production risks.

General management: Supervisory support, personal supervision, seasonal planning, record keeping, counselling and advice received, training and experience of manager, management structures, long-term planning.

Labour management: Labour organisation, labour situation, attitude to legislation, remuneration, development actions, training inputs, efficiency and supervisory contribution of labour.

Farmer aspects: Way of life, career stage, property plans, decision-making, stress, family aspects, wife support on farm, community involvement.

Financial situation: Accounting services, credit sources, access to income, impact of inflation, marketability of farm, bond status, scale of operation, income aspirations.

The program can be edited to modify either or both the aspects and the factors to suit the specific needs of the user. **The default entries represent the conclusions derived by the researcher from the interviews undertaken in the course of the pilot project, and should be regarded as some of the results of that study.**

At the conclusion of the interview with the farmer, the interviewer runs through the program and, for each factor, identifies the key word that best fits the impression he has gained during the interview. The program then converts this to a rating and, for each of the six aspects, an integrated combined rating of the factors is generated. A rating profile of the farm and farmer is presented on the screen. **The whole process takes a few minutes and it is possible to identify strengths and weaknesses, bottlenecks and the likely consequences of remedial action or changing external circumstances.**

To be fully effective, and to be in line with the principle of participation, the analysis should be discussed with the person being interviewed as soon as possible, and modified if necessary. This was not done with the taped interviews.

Each factor is supported by a help function. **The help functions were drawn up in the light of information acquired during the project interviews** and are intended to prompt the user rather than to prescribe.

In using SAPFACT, a cascade approach can be followed. The user can eliminate possibilities progressively. Should the financial position of the farmer be serious,

there would be little point in taking other action until the necessary financial arrangements had been made. Similarly, there is little point in emphasising scheduling methods if the water supply is irregular.

The SAPFACT user is in a position, at the conclusion of the process, to assess the strengths and weaknesses of the farmers interviewed and to identify opportunities and vulnerabilities of the group as a whole.

7. CONCLUSIONS

Importance of qualitative research in Agriculture and Engineering: This is an exploratory project but it has shown that there is a place for qualitative research in Agriculture and Engineering, as there is in Medicine. Technical specialists with the necessary aptitude and an adequate introduction to techniques can enrich investigations, both at research and at operational level, by applying the basic principles of qualitative research. **SAPFACT** is an innovative attempt to facilitate the interpretation of interviews undertaken by people trained in the rigid disciplines of science and engineering.

Important role of farmers: The project emphasises the potential role of the individual farmer, in contributing to the design of new technology and development programmes. **SAPFACT** is a tool that can be applied by advisory personnel, researchers and commercial concerns in their direct dealings with farmers to establish a realistic profile of resource- and people-based strengths and weaknesses.

Perceptions: The project has disclosed that the perceptions that "we" have of "them" can be very wide of the mark. Decisions are based on the decision-maker's perception of the facts at his disposal; consequently, decision-making is not altogether mathematical or objective. The perceptions of the person carrying out the decision, in this case, the farmer, are also an important factor in the appropriateness of proposals. This research showed that the following has to be taken into account:-

- Irrigation tends to be a chore to most irrigation farmers and is nowhere near top of their priority list
- Water wastage is a consequence of anxiety about under-watering and not an irresponsible disregard for natural resources
- Irrigation increases rather than reduces the risk factor in farming
- Farmers may have good reason not to accept the recommendations of engineers and scientists
- It is not true that a farmer values equipment or services only if he pays for them

- Irrigation farming is labour-intensive, which will have major economic consequences in the future, placing a premium on developing present labourers to be active participants in the organisation and management of the irrigation function.

The increasing attention being given to small farmers, facing circumstances unfamiliar to the specialist, has emphasised that "perceptions" of the farmer involved are just as important as "facts" available to the specialist. Internationally, there is recognition of this, particularly by agencies concerned with development funding.

Significant *verbatim* comments by farmers covering a broad spectrum of their perceptions and activities are included in Appendix B.

Farming practices: Semi-structured open-ended interviews proved to be particularly effective in obtaining insights into farming practices. This is of particular importance when technical aspects, such as irrigation and mechanisation, are directly related to these practices. It was noticeable that two interviews undertaken on sugar farms captured the essence of the "hows" and "whys" of irrigation in the area. The technical detail that emerged from these interviews was comprehensive and detailed and explained anomalies that had been concerning design engineers with considerable experience in this field.

Irrigation management and training: The interviews have emphasised the relatively low priority that most farmers place on irrigation management, and the almost complete dearth of effective irrigation extension. There is, possibly, a link between the two. Effective extension is not possible if the subject is not important to the farmer! There can be no doubt that more effective management would be in the interests of both the farmer and the country but this will require a new approach based on farmer perceptions and priorities.

Labour development: The survey emphasised the value of the support provided by employees who had developed from being labourers to being active participants in the organisation and management of the irrigation function.

8. RECOMMENDATIONS

The important contribution that qualitative research techniques, based on open-ended interviews, can make to commercial irrigation farming and planning, has been demonstrated by this pilot project. Internationally and in the RSA, similar techniques, including Participatory Rural Appraisal (PRA), have gained acceptance in small farmer development. The procedures are suitable for use by technical specialists after initiation into the techniques and are time- and cost-effective.

It is recommended that these techniques, including the computer program SAPFACT, be drawn to the attention of people concerned with irrigation and water supply, by means of publications and workshops.

TABLE OF CONTENTS

TABLES:

FIGURES:

APPENDICES:

CHAPTER 1

INTRODUCTION

1.1 THE ORIGIN OF THE PROPOSAL

This pilot project, ***The interdependent factors which determine the viability of irrigation farming,*** was initially proposed by the researcher because, when he was, for a number of years, a member of the interdepartmental committee concerned with irrigation policy, he noticed that committee members instinctively felt the lack of the human factor in the well-researched quantitative reports developed by task groups consisting of engineers, scientists and economists. Even though none of them ever consciously doubted the scientific merit of the reports or that recommendations were realistic and achievable, committee members constantly referred to personal experiences with farmers and their problems or to visits to family or friends farming in the area under consideration, before making decisions.

As such visits had often taken place many years before, and were limited in their extent, it became clear to the researcher that a broader base of "human factor" information would serve a valuable purpose. He proposed a pilot study to develop this information base and provide an important understanding of the complexities of irrigation farming. He specified that it should show, in particular, how there could still be many apparently successful irrigation farmers at a time when financial and economic evaluations for new and rehabilitated irrigation projects were predominately negative.

1.2 RESEARCH OBJECTIVES

When the proposal was submitted, it was felt that case studies could assist policy-makers and practitioners "in visualising and relating to the realities of the situation".

The research was to be based predominantly, but not entirely, on questionnaires and quantitative research methods:

> *The basis of the study will be the undertaking of in-depth surveys on farms in three regions. The data obtained will be utilised to synthesize stratified profiles of* ***representative farms*** *which will be incorporated in case studies.*
>
> *The survey will, however,* ***include social and economic facets*** *and the inputs of specialists in undertaking open-ended investigations of this nature will be obtained.*

An inferred objective was to compile a reference manual that would provide policy-makers and practitioners with information that is normally only available through first-hand contact with farming relatives or friends i.e. **"an in-law in each irrigation area!"**

It soon became clear, however, that for reasons that will become apparent, the dream of a reference manual of this nature was not only unattainable, but also undesirable. There has, consequently, been some revision to the research objectives.

1.3 THE EVOLUTION OF THE RESEARCH APPROACH AND THE REVISED OBJECTIVES

1.3.1 The Evolution of the Research Approach

The social scientist supporting the team proposed that qualitative research, based on taped, semi-structured open-ended farmer interviews, be employed in preference to the questionnaire surveys more familiar to the research team. It soon became apparent from the interviews that the "missing link" that the decision-makers had been instinctively seeking, was the input of the farmer as individual and entrepreneur.

The technique of developing representative farm profiles, as originally proposed, has been successfully applied in technical and economic studies. However, individuality is submerged in the "representative farm" or "reference manual" approach, and the objective of a better understanding of people and their motivations thus defeated. This is because few scientists, with the exception of social scientists, make use of qualitative research methods. These have specific and limited applications in extension science and agricultural economics, while there are increasing applications in medical science. However, the degree to which qualitative research approaches can augment the methods normally used for investigating technical and management matters has been a revelation.

It was found that a technical specialist can apply qualitative methods, provided he has the necessary aptitude and training to conduct a sympathetic and objective interview, with the emphasis on listening. An open-ended discussion lasting an hour can reveal a great deal. Analysing and presenting the data is more difficult.

Social scientists are specifically trained in the necessary techniques, but their method of reporting is discursive and is aimed at sociological rather than technical issues. However, once we had revised their reporting techniques, we found that the application of qualitative methods to technical problems and situations by people not specifically qualified in the social sciences, is an exciting innovation.

1.3.2 The Revised Research Objectives

An important facet of the revised research objectives is the assessment of ways of incorporating qualitative research techniques into the portfolio of technical specialists. The project aims to develop a practical system for analysing and presenting the data applicable to irrigation farmers. This would facilitate the proposed establishment of an extended information base for irrigation planning and development.

CHAPTER 2

THE MEANING OF QUALITATIVE RESEARCH

2.1 INTRODUCTION

This chapter examines the potential role of qualitative research in answering questions relevant to technical specialists, and specifically in identifying the factors that contribute to the success or failure of irrigation farming. Scientists are more familiar with quantitative research, which relies on figures and statistics and is aimed at achieving results that are generalisable for a large population (Mouton and Marais, 1988). In many respects, qualitative research is the opposite as its results are certainly not generalisable, nor can they be presented in terms of statistics. Qualitative research, though, is more in-depth and is particularly useful in identifying the important issues that need to be considered by a researcher, as we have done in this research, or to offer a more detailed understanding of issues raised by quantitative research.

2.2 QUALITATIVE RESEARCH, THE FORGOTTEN ALTERNATIVE

Until fairly recently few scientists, with the exception of social scientists, made use of qualitative research methods. One of the reasons for this is the high value the scientific community attaches to statistics. Researchers often use statistics because it is expected of them and not because statistical analysis can always adequately address the research question. Results from questionnaire surveys, regardless of their internal validity (that is, whether they accurately reflect the phenomenon that was studied) or external validity (that is, whether they are generalisable for the whole population) are often accepted simply because the findings can be summarised in a quantitative form. Thus, statistics have become the master rather than the tool of research and development.

Quantitative and qualitative research are not mutually exclusive but can be most effective when used in conjunction with each other. There are many research questions that cannot be adequately addressed by quantitative techniques alone and, by ignoring the value of qualitative methods, scientists have limited their own effectiveness.

Backeberg (1989) made effective use of qualitative research to supplement quantitative data in studies of irrigation in the Great Fish River valley, the Komati basin, Sundays River, and the Orange-Vaal basin.

2.3 QUALITATIVE RESEARCH IN A NUTSHELL

Qualitative research is largely descriptive and aims to understand a situation from the point of view of the people being studied; in other words, to study the world as "defined, experienced and constituted by the investigated people" (Smaling, 1993). Mouton (1988) describes qualitative research as "characterised by attempts on the part of the researcher to penetrate to the innermost nature of phenomena". Qualitative approaches are also holistic in that they operate on the assumption that the whole is greater than the sum of its parts (Ferreira, 1988).

The techniques used for this type of research are flexible, explorative and open, and there is a cyclical relationship between data gathering and analysis. The investigation process can be equated to a journey of discovery — the researcher comes closer to the heart of the subject being studied as more and more information is revealed. Exploring the subject from different vantage points provides the opportunity to cross-check observations and test their validity. Various qualitative methods are distinctive and have definite applications.

2.4 QUALITATIVE VERSUS QUANTITATIVE: WHEN IS WHICH APPROPRIATE?

2.4.1 General

Selecting the appropriate research method(s) can determine the validity and usefulness of the final results. The first choice confronting a researcher is whether qualitative or quantitative or both techniques should be used. The nature of the research question should be the primary factor on which this decision is made. Secondary factors that also have an influence include available time and resources, whether generalisability is necessary, and the required level of precision.

The strengths and limitations of each of the two broad methods of research will also influence which technique is appropriate in a particular situation. This choice is not always an 'either-or' choice. Some research questions can only be adequately answered if methods from both the qualitative and quantitative schools are used. Such a combination of techniques can contribute towards a more holistic assessment of the phenomenon being studied.

2.4.2 The Research Question

The nature of the research question has a major influence on the decision to use either qualitative or quantitative methods. This section describes the main differences between qualitative and quantitative research as they are influenced by the research question (Mouton and Marais, 1988).

The first and perhaps foremost difference is that quantitative researchers impose their own structures or frameworks upon a phenomenon. They therefore use set categories, structured questionnaires or tools such as psychological tests. In contrast to this, the qualitative researcher is concerned with an open-minded study of phenomena as they exist.

The second major difference between the two groupings concerns the position of the researcher in the research process. In qualitative research, the researcher tends to become more involved in the phenomenon being studied, whilst the quantitative researcher attempts to observe from a distance.

Qualitative techniques are most appropriate when research is aimed at understanding the essence of a phenomenon and when people are the main source of information on the subject. They are not appropriate if the research question concerns the explanation of phenomena in terms of causal relationships. In such instances quantitative methods associated with experimental designs are more fitting.

Qualitative techniques should also not be used if the research question is aimed at obtaining representative information about a large population. Sample surveys, using questionnaires as the research tool, are far more effective in such situations. Questionnaire surveys, and other quantitative techniques can also be used to assess the generality and distribution of conclusions reached through qualitative research.

2.4.3 Time and Resources

The time and financial resources at the disposal of the researcher also influence his methodological choices. Questionnaire surveys, one of the more widely used quantitative techniques, tend to be expensive and time-consuming. Qualitative methods can often provide accurate information within a much shorter time period and at much lower cost, losing only generalisability, which is not always necessary. This is one of the main reasons why researchers involved in agricultural and rural development prefer qualitative techniques to questionnaire surveys (Chambers, 1992a).

2.4.4 Validity

The validity required also affects whether a researcher will choose qualitative or quantitative techniques. Two types of validity can be distinguished: internal and external validity.

Internal validity refers to the extent to which the results of research findings accurately reflect the situation being studied (Bernard, 1988). All researchers should strive towards high levels of internal validity as it ultimately reflects on the quality of the research and its potential contribution to the pool of knowledge. Examples of techniques with very high levels of internal validity are experiments conducted in a laboratory, and participant observation.

In contrast to this, external validity is not always required. This kind of validity relates to the generalisability of research findings (Bernard, 1988). Sample surveys, designed to be representative of a particular population, are good examples of research techniques with high external validity. However, if questionnaires are used in the wrong context and inappropriate questions are asked, a survey can have low internal validity, which virtually nullifies the external validity (Bernard, 1988).

2.4.5 Precision

Another factor that can influence the choice of research methods is the degree of precision required. Sometimes it is not vital to know the exact percentage of people who hold a particular opinion or have a certain practice and approximations are sufficient. Well conducted qualitative research can, in such situations, be as appropriate as quantitative research.

Section 2.4 has shown that, in most cases, qualitative research can offer the appropriate information with efficient use of resources. In the light of the specific goal of this research, that is, to gain a broader, more in-depth understanding of the factors important to farmers, qualitative methods can be most useful.

2.5 OVERVIEW OF QUALITATIVE RESEARCH

The main methods used by qualitative researchers, and the factors that influence them, are now reviewed. The basis of most techniques is the interview. An "interview" can be the interaction of two people or a discussion amongst larger groups.

2.5.1 THE INTERVIEW

The interview is the basic building block of most qualitative research. It is also a tool that is often used as part of the study-and-analysis phase of extension programming (Bembridge, 1991; Van Den Ban and Hawkins, 1988; Benor et al, 1984; Cernea et al, 1985).

Interviews can be classified into four main categories, based on the degree of control and structure imposed on the interview by the researcher (Bernard, 1988).

- *Informal interviews have no structure or control. Examples are chance* encounters and discussions.

- The unstructured interview is carefully planned, but minimum control is exercised over the responses. Such interviews are arranged and the interviewer has an idea of what he is looking for, but the format of the interview simulates an informal discussion. This interview technique is often used for exploratory research.

- During semi-structured interviews, the interviewer is in full control of the *interview and uses an interview guide. Despite this, the interview is still* flexible enough to allow the researcher and respondent to identify and follow new leads. Semi-structured techniques are often used in situations where there is limited time for the interview.

- Structured interviews have clearly set out questions that are kept as uniform as possible from interview to interview. Examples include questionnaires, pile sorting, or the rating or ranking of a list or range of items.

All these kinds of interviews can be used with groups or individuals.

2.5.2 FACTORS THAT INFLUENCE THE INTERVIEW

2.5.2.1 The Interviewer

The researcher plays a central role during the interview. The interviewer's personal characteristics influence interaction with the interviewee and ultimately the quality of the observations. The degree to which the interviewer is committed to do justice to the subject will reflect objectivity and ultimately influence the internal validity of the research. The following characteristics need to be

taken into account when selecting and training researchers: their objectivity, sensitivity and empathy, enthusiasm, and communication skills.

2.5.2.2 Objectivity

During an interview, the researcher becomes an instrument who measures a given situation. Within this context, his/her subjective experiences are likely to influence both the interview and the interpretation of the information collected. Objectivity can never be absolute and one can at most only strive towards it. The basic meaning of objectivity in a methodological context is doing justice to the object of the study (Smaling, 1990a).

2.5.2.3 Sensitivity and Empathy

The interviewer should also be sensitive to various moods, meanings, nuances, expressions and responses and be able to interpret those. (Mascarenhas, 1991).

Sensitivity enables the researcher to identify leads for new lines of questioning and assists in making the respondent feel at ease. If the researcher can identify negative moods and feelings timeously, potential disasters can be avoided.

Another important prerequisite for successful interviewing is empathy. The empathetic interviewer tries to see the world through the subject's eyes. This concept is similar to role-taking (Smaling, 1990b). Respect for the world and experiences of the subject increase the chances for a meaningful exchange and valid interpretation of information.

2.5.2.4 Enthusiasm

One of the keys to successful interviewing is the ability to express an interest in the object of study. The desire to learn from others is subconsciously communicated during the interview process and, unless the interviewee feels that the researcher is interested in what he is saying, he is unlikely to open up and share information.

2.5.2.5 Communication Skills

The interviewer should also have the ability to make people talk and establish an interchange that reveals authentic, interesting and useful information. Good listening skills are essential for effective communication.

2.6 EXAMPLES OF QUALITATIVE TECHNIQUES

The ways in which interviews can be made to answer a range of research questions appropriately are now reviewed.

2.6.1 Participant Observation

2.6.1.1 The Technique

Participant observation is a technique that is frequently used by anthropologists. The best way to describe it is 'learning by doing'. The researcher becomes part of a community and participates in daily activities. After a while, the presence of the researcher as 'outsider' is not noticed and the community members continue with their daily activities as normal.

During the day, the researcher immerses himself in the daily activities of the community or group being studied. At night, he distances himself from the events of the day in order to analyse his learning experiences.

Skills such as knowing the local language, training your memory, and increasing your awareness, combined with a sincere desire to learn more about a particular culture are essential for successful participant observation. Informal interviewing techniques are often used during the first phases of participant observation — the researcher memorises informal conversations he had during a day in the field and jots them down at night.

2.6.1.2 Application

Participant observation is usually used to study the functioning of social institutions or organisations. Within the context of irrigation, it could be used when studying the internal dynamics and functioning of an irrigation scheme. Another application could be to work on a farm to learn more about the way in which farmers make irrigation scheduling decisions.

Participant observation is not just useful as a technique on its own — it can also augment other methodologies. It can be used to facilitate the collection of qualitative and quantitative data (Bernard, 1988). By becoming part of a community, one reduces the effect of reactivity normally associated with data collection. If one then uses other research techniques, the information is likely to be much more reliable. Participant observation can be used as a tool by the developers of a questionnaire to help them formulate relevant and appropriate questions. Participant observation also helps one to understand the 'meaning' of observations made by other methods.

2.6.2 Unstructured and Semi-Structured Interviewing

2.6.2.1 The Technique

An important characteristic of unstructured interviews is that the researcher prepares before the interview only by thinking about the topics that need to be covered. During the actual interview, the interviewer exercises as little control as possible and allows the respondent to determine the course of the interview. Probing and questioning is based on information provided by the

respondent and is not associated with an interview schedule.

Semi-structured interviews differ from unstructured interviews in that the researcher develops an interview schedule before the actual interview.

The interview schedule is a list of the key concepts that the researcher aims to cover during an interview. During the actual interview the schedule is not used like a questionnaire, but as an unobtrusive memory aid. Semi-structured interviews are therefore slightly more controlled than unstructured interviews but are still flexible enough to allow for probing and the pursuit of leads.

2.6.2.2 Application

Semi-structured interviews form the basis for the open-ended taped interviews which were utilised in this study and the application and procedure is dealt with in detail in Chapter 3.

Unstructured and semi-structured interviews are the basic building blocks of composite methodologies developed for use by persons not specifically qualified in the social sciences. These include Rapid and Participatory rural appraisals (see paragraphs 2.6.3 and 2.6.4) and Sondeo. The Sondeo method, which concentrates on achieving effective inter-disciplinary integration, is considered in some detail in Chapter 3.

On their own, unstructured interviews are very effective for the study of sensitive topics such as sexuality, conflict, violence or politics (Bernard, 1988) and of relatively unknown subjects. They are also useful in the beginning of a study to help with the definition of a research problem and the development of interview schedules. Some researchers use unstructured interviews to establish rapport with people before starting with their actual research.

Semi-structured interviews can be used to cover an infinite range of research topics and are just as effective on their own as when used in conjunction with other methods.

The technique is most useful when there is limited time and little or no opportunity for further visits, and is particularly suited to researching technical and management related issues. Semi-structured interviews should also be used if more than one interviewer is involved in fieldwork, in order to ensure that approximately the same topics are covered during interviews. It is therefore this method that was used for this research. It fulfils the criteria of resource efficiency, makes it possible to do interviews around the country, and could theoretically provide the sort of information being sought.

2.6.3 Rapid (Relaxed) Rural Appraisals

2.6.3.1 The Technique

Rapid Rural Appraisals (RRAs) were originally developed to provide quick and reliable information for agricultural and rural development project planning. They were conceived as an alternative to questionnaire surveys (Chambers 1980; Subhadhira *et al*, 1988; Chambers 1992b).

The method is based on direct observation and interviews with people and can be described as "good investigative journalism" (Pratt *et al*, 1988). The techniques used in RRA are not totally new — most are being used in other contexts. Its originality is vested in the principles that guide its application. These principles are defined by the Khon Kaen school (Subhadhira *et al*, 1988):

- The research process is exploratory, highly iterative and aimed at rapid and progressive learning
- Research topics are examined from several points of view (triangulation)
- The use of indigenous knowledge is emphasised. This is based on the premise that rural people and farmers know their local conditions and environment well
- Teamwork, where researchers from different backgrounds work closely together, is also emphasised.

2.6.3.2 *Application*

Virtually any research topic can be covered using RRA techniques. This method is at its most powerful when it is utilised by a multi-disciplinary team as part of project planning. Other applications include problem identification for purposes of developing product specifications and management procedures, and for extension programming. RRA can also uncover broader questions that can be tackled using more intensive policy-focused research (Pratt *et al*, 1992).

2.6.4 Participatory Rural Appraisals

2.6.4.1 *The Technique*

During the late 1980's, users of RRA started to realise that there was a greater need for the active participation and involvement of rural people and farmers in the research process. This gave rise to the development of Participatory Rural Appraisals (PRA's). PRA's have their origins in applied anthropology, Farming Systems Research and RRA's (Chambers, 1992a). The main distinction between the PRA and RRA techniques is that PRA's give the people "studied" greater control over the research agenda, information collection and analysis. PRA's also limit the role of the researcher and specialist to facilitation. The high degree of farmer participation is based on the premise that farmers know their own circumstances best. Their ability to analyse their own farm systems, determine their own priorities and adjust their practices accordingly is also recognised.

The techniques used in PRA's are very similar to those used in RRA's. Semi-structured interviewing, direct observation, and visual techniques (Chambers, 1992 a&b). These visual techniques are particularly powerful when working with illiterate farmers.

The use of PRA's has many advantages, some of which are that:

- They enhance the mutual exchange of information between farmers and specialists

- Information tends to be more reliable than when other more conventional methods are used, and

- Information gathering becomes an inseparable part of the processes of planning and extension (Chambers, 1992; Pratt *et al*, 1992).

2.6.4.2 Application

PRA techniques can be applied to virtually any research problem. Their benefits are greatest if the research is linked to the planning and implementation of a development project. Participatory mapping and matrix ranking can, for example, be used to identify community water resources and priorities for development. The information obtained can in turn be used for the development of a water improvement plan by a team consisting of specialists and community members. PRA's have been developed primarily for application where there is a need to harness the knowledge of small farmers and to ensure transparency in decision-making. They are, however, also applicable to "sophisticated" commercial farmers, and could have a place in all irrigation planning. The researcher used much the same technique in connection with a major soil conservation problem on the Springbok flats, where he moved through the area for three days with the community. Ultimately, a method developed by one of the farmers, and thoroughly understood by all, was officially adopted.

2.7 CONCLUSION

There are situations in which qualitative methods are recognised as appropriate. Researchers need to consider the nature of their research question, and factors such as available time and resources, the type of validity, and degree of precision needed before selecting their methodologies. In the case of technical and managerial issues, qualitative research can be a valuable supplement to more conventional approaches. When quantitative data is available, it provides a valuable base for the more people-orientated qualitative interviews. Similarly, once specific attitudes and needs have been identified by qualitative research, it may be desirable to assess the scale and distribution of perceptions by means of quantitative methods.

We have identified semi-structured interviews as the most appropriate method of qualitative research to achieve the main aim of this research, that is, to identify the independent factors that influence the decision-making of farmers. Another aim of the research is to actually test this method to assess whether it does, in fact, provide the information required.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION TO SURVEY PROCEDURES

The previous chapter argues that a qualitative methodology could contribute to fulfilling the goals of this research, namely to throw light on the interdependent factors that influence the viability of irrigation farming. In particular it is important to gain an understanding of this process as it is seen by the farmers themselves. It is also suggested that semi-structured interviews could contribute to assessing both technical and managerial aspects of irrigation farming. The objective is not to find an alternative approach that would compete with other research and investigational procedures, but to assess whether or not it is possible to add a complementary dimension.

In keeping with qualitative research procedures, the research was not based on preconceived hypotheses. The approach to the investigation, though, changed with developing knowledge and experience as more farmers were interviewed. As is normal during the process of qualitative research, researchers constantly reassessed their position and aims.

The application of qualitative research in agriculture is largely confined to specific aspects of extension. This exposure to qualitative issues of people whose interest is generally focused on the technical aspects of irrigation only was very significant.

The major part of the field-work consisted of a series of semi-structured taped interviews but this was augmented by one experimental Sondeo survey undertaken by a multi-disciplinary group.

3.2 SEMI-STRUCTURED INTERVIEWS

Although qualitative research may not be as "statistical" as other methods, it is still systematic and strives for internal validity. Before the interviews could, therefore, be embarked on, a number of preliminary steps had to be taken. The research team had to be familiarised with the key issues of the project, and to achieve a degree of consensus about the form and content of the proposed interviews. Extensive discussions were held between the members of the project team (which included the social scientist constructing the guidelines for the interview, and personnel of MBB, who were to conduct the interviews) and people intimately and practically involved with irrigation farming and research. These discussions took place on three farms and were in the form of extended trial interviews, followed by post mortems.

Then guidelines had to be drawn up for the semi-structured interviews. The guidelines were constructed by the social scientist on the project team, on the basis of the preliminary discussions, and in the light of the farm management approach of Boehlje and Eidman (1984). These guidelines can be summarised as follows:

Under no circumstances should a "questionnaire" approach be followed during an interview. Record a general open discussion based on the following broad issues:

- **Farmer:** Age, qualifications, training, experience etc.
- **Household:** Wife, children, managers as Farmer above, plus their role in running the farm.
- **Farm:** Size, area under irrigation, crops, soils, climate etc. History of the farm and the factors that determined decision-making and development in the past and will influence the future.
- **Irrigation:** History of irrigation development, present methods, operational details and problems. Irrigation management, scheduling, yields and quality, water sources, constraints.
- **Management:** Why does he farm, financial objectives, management style, record-keeping, planning, computers, vision of the future.
- **Finances:** Value of farm, turnover, profit, land rents, ratio of own capital to borrowed. Off-farm income, subsidies, changing markets and prices and uncertainty.
- **Labour:** Number, composition, training, housing. Management, labour legislation.
- ***Support and infrastructure:*** Extension, study groups, consultants, co-ops, firms. Transport, power, communications.
- **Community activities:** Part played by farmer and family in organised agriculture, co-ops, Rural Foundation, church, commandos, study groups.
- **Environment:** Attitude to conservation, etc

Lastly, interviewers were trained by working through the guidelines with them. The interviews on the Natal coast were undertaken by the social scientist who drew up the interview guidelines. This made possible a concurrent testing and piloting of the interview techniques with substantial data collection. The research team discussed progress and emerging trends during the period when these pilot interviews were being conducted.

Interviews were conducted on the farm with the farmer and took the form of a free-flowing general discussion, with the starting point normally being determined by the farmer. The interviewers did not dominate discussion and allowed the farmer to determine the general direction of the discussion. Gentle prompting and probing when necessary ensured that most of the information required was covered.

The objective was to gain broad insights into the attitudes of irrigation farmers, and the environment in which they were operating. "Upper third" farmers, who could be expected to be well informed,

were therefore selected as the sample. Normally, appointments were made well in advance but there were cases where farmers interviewed recommended neighbours whom they felt could make a contribution.

The original intention was to share the interviewing between the senior researcher, the social scientist and two MBB staff members with considerable experience of farm surveys. As a result of other commitments, the MBB staff members only undertook five interviews in the Brits and Northern Transvaal areas, and took part in the three initial "training" interviews. The social scientist undertook the seven interviews on the Natal coast, two of them in the company of the senior researcher. The balance of the interviews, which covered the area along the Orange River, the OFS, Loskop, Winterton and the Western Cape were undertaken by the senior researcher. Interviewing took place during late 1991 and the first half of 1992.

3.2.1 SAMPLE

This section describes the farmers interviewed during the course of this research and how they were identified.

Natal coast: The seven cane farmers interviewed were suggested by the Executive Director of the SA Cane Growers Association. All but one were well established, but they varied in age. The one exception had just sold his farm and was consulting. Four of the farmers on the North Coast had diversified by developing citrus. The three South Coast farmers were in a dry area and produced vegetables to widen their production spectrum. One farmer had just moved out of cane and was developing beef cattle.

Orange River: This area between Vanderkloof and Hopetown has been intensively researched by the departments of Soil Science and Agricultural Economics of the University of the OFS. Both departments were able to suggest farmers whom they felt would make a contribution. The eight farmers interviewed were not confined to this group, however, and farmer suggestions were followed up. The farms on the north and south banks differ considerably. North bank farmers are usually on land developed as the Ramah scheme and receive canal water, while south bank farmers usually have more difficult lands and pump water from the river.

Brits: The three farmers were suggested by an irrigation equipment supplier. One, a large wheat and vegetable producer, had just gone into liquidation, while the other two were producing citrus for juicing.

Northern Transvaal: Interviews with two farmers in this area were used. One was a small farmer producing seed maize very successfully, while the other was a large potato and beef producer.

Loskop: Three farmers were interviewed. They were suggested by a very experienced and influential technician with many years of irrigation experience. They had all been influenced by the scientific extension work of Dr Streutker, then of SIRI, in the early 1980's.

Western Cape: The five farmers interviewed were clients of MBB and were selected by the local branch office. They included wine farmers from Robertson, apple farmers from Elgin and a Stellenbosch wine farmer diversifying into fruit under irrigation.

OFS: Only one farmer was interviewed.

Winterton: This is an area where farmers have co-operated with the University of the OFS in developing automatic weather station scheduling. Names were supplied by the University. Five farmers were interviewed but only one interview was transcribed as it seemed to reflect the situation.

3.3 CRITICAL ASSESSMENT OF THE SEMI-STRUCTURED TAPED INTERVIEW METHOD

3.3.1 ADVANTAGES

- Information gathering is quick and costs moderate as compared with questionnaire surveys.
- Semi-structured interviews are effective in establishing patterns and interactions.
- Interviews can be conducted by social scientists or technical specialists with training in interviewing and the right aptitude.
- A relatively limited number of in-depth interviews can make a major contribution to the knowledge base.

The interviews illustrated that the gap in information about the farmers themselves, and about the plethora of factors that influence the viability of their farming enterprises, can be filled at relatively short notice, and at moderate cost through qualitative research. There is every justification for the inclusion of these techniques, as a routine, in virtually all irrigation investigations.

The semi-structured interviews proved effective in establishing the pattern of irrigation farming and the interaction between farmers and their circumstances. Indeed, one good interview with a knowledgable farmer, carefully interpreted, can explain irritating anomalies and inconsistencies.

There is the view that, because irrigation is a technical subject, investigations should be undertaken by technical specialists. This concern was not borne out by this study. The social scientist had little knowledge of irrigation at the outset of the study but, as a specialist in conducting interviews, had no difficulty in obtaining a balanced picture. Indeed, her interviews proved to be particularly revealing in regard to the technical aspects of the acceptability of irrigation equipment for specific operational circumstances. This is possibly because the farmer himself must, of necessity, integrate inter-disciplinary inputs in his day-to-day operations, and this is reflected in an interpreted form in the interview.

A technical specialist can undertake the interviews successfully provided he has the aptitude to achieve rapport with farmers and has received some initiation into the procedure.

3.3.2 DISADVANTAGES

- Semi-structured interviews, in isolation, cannot identify the components of specific

technical problems requiring interdisciplinary expertise.

- Recording of interviews is not always easy or successful.
- Transcription of interviews is time-consuming.
- Organising of data requires expertise.
- Feedback to the interviewer is delayed.
- Research must be carefully planned.
- Interviewers must be carefully selected.

It was emphasised, in earlier chapters, that the selection of qualitative procedures was dependent on the objectives of the research. The semi-structured interview undertaken by a single interviewer is a powerful way of capturing the existing position and identifying problems and restraints. It has limitations, however, if solutions are being sought for specific problems, or if an integrated plan of action is to be developed. Problems were identified during the surveys and subsequently discussed with individual specialists, but little success was achieved in arriving at possible solutions. This is understandable as the specialists have not themselves been exposed to the situation on the ground, have their own perceptions of the problems in the area, and have little opportunity or desire to interact with specialists in other disciplines.

The recording of interviews is essential, but not always easy or successful. The transcription of the interviews and organising of the data are time-consuming and require skill and experience.

Experience with participative techniques has shown the value of feed-back to the farmer. The time-lag imposed by the need to transcribe and process the interview makes this difficult.

An example of a full transcript of an interview is contained in Appendix C.

3.4 SONDEO METHOD

A recognised procedure where coordinated interdisciplinary inputs are essential in order to solve specific problems, or produce development plans for an area, is the Sondeo approach (Hildebrand, 1981).

The Sondeo technique is as applicable today in the RSA as it has been for the past ten years in Guatemala (where it was developed) and in other parts of the world. It is based on open-ended discussions with farmers and makes use of a multi-disciplinary team which concentrates on an area for a week. The discussions differ from the semi-structured taped interview in that they are not recorded and subsequently transcribed, and technical specialists with the necessary aptitude and an adequate introduction to the interviewing technique are included in the team. The output of the discussions is integrated and moderated in the course of team discussions.

The Sondeo approach encourages the production of a solution that meets the needs of a farmer as seen by the farmer and fulfils all the criteria identified by the broad range of disciplines represented

on the Sondeo investigating team.

Sondeo can extend the scope of the open-ended interviewing technique, while eliminating the problems with transcription and presentation. Consequently, the Sondeo's value in answering the questions raised in this pilot project was assessed. There was some difficulty in finding sufficient and appropriate specialists who would be able and willing to participate in an experiment. The Central Branch of the SA Irrigation Institute provided the opportunity through the need to plan a Farmers' Day. It was to be held in the Brits area at the end of August 1992, with the theme "Irrigation in the drought". The organising committee put together a team of fourteen highly qualified professionals representing a wide range of disciplines and interests for an experimental Sondeo to find out what the farmers wanted.

Some 40 farmers were interviewed in three days, covering the Brits, Krokodil River and Beestekraal areas. Both large and small farmers were represented as were the main crops - wheat, tobacco and vegetables.

The three days did not allow enough time to compile a full development report, but the content and structure of the Farmers' Day was developed by consensus based on the interviews, and the observations made by the different specialists.

Further details of the Sondeo procedure and the results achieved are contained in Appendix A of the report.

3.5 CRITICAL ASSESSMENT OF THE SONDEO METHOD

3.5.1 ADVANTAGES

- Interdisciplinary co-operation is achieved.
- Open-ended interviews are efficient in gathering practical information.
- The interviewee participates in decisions about what he needs.
- Consensus is achieved from many points of view.

The degree of contact between team members before the Sondeo was surprisingly limited. The two main actors in the area, one with possibly the most influential extension role and the other the principal supplier of equipment and the main irrigation advisor to the farmers, had never met one other. This was probably due to conflicting commercial interests. In the course of the leading roles they played in organising the Sondeo, this state of affairs changed.

It was obvious that team members appreciated the opportunity to get to know one another under the circumstances created by the Sondeo. The discussions were valuable but the most important contacts were the visits, in oddly assorted pairs, to farmers. These made it possible to get to know different professionals in the field and the process made it clear that improved interaction and co-operation in the future in the area can only be to the benefit of all.

The practical application of the open-ended farmer interviews came as a revelation to most of the participants. The comment was made that it was almost unknown for farm visits to be made without a specific objective, either to "sell" a concept or a programme or to acquire specific information or statistics. Letting the farmer make the running, allowing him to talk about the questions he regarded as important, broke new ground. The interviews were particularly valuable in that the team members talking to the farmer represented unrelated disciplines and, frequently, unrelated approaches.

It became evident in the development of the plans for the Farmers' Day that a common view of the situation facing the farmers had been received. The anticipated consensus was achieved. Quite apart from this, the whole team gained new insights into the perceptions, problems and constraints that determined farmer actions.

The Sondeo approach, applied with discretion, has exciting possibilities.

3.5.2 Disadvantages

- It is difficult to make up a multi-disciplinary team.
- All applicable disciplines should be represented.
- Much depends on the facilitator who must co-ordinate a consensus report.

Three days is too short for a survey of this nature, five days is a minimum.

It is not easy to gather a diverse group of professionals to undertake a Sondeo. The team needs to be constituted for the specific task to be undertaken and all applicable disciplines should be represented.

It is important that the facilitator be able to handle the group effectively over an extended period and encourage and negotiate a consensus report which is genuinely supported by the team. This is not easy.

CHAPTER 4

RESULTS OF THE SURVEY

4.1 INTRODUCTION

The researchers were relatively new to irrigation at grass roots level so that, while some of the impressions gained may appear to be naive, they were not over-influenced by preconceived ideas.

The interim report to the steering committee contained a section entitled EMERGING TRENDS which contained the essence of the findings of the pilot project at that stage. It is not possible to improve on this review, although it was prepared at an intermediate stage of the project. It was prepared by the social scientist, and is an excellent example of analysis and report writing by an experienced qualitative researcher. The review is included in full in this chapter. The trends discussed were arranged so as to follow the broad themes of the guidelines for the semi-structured interviews as outlined in paragraph 3.2.1.

Towards the conclusion of the pilot project, it was decided to develop a computer routine that would facilitate the qualitative analysis of open-ended interviews by technical specialists and practitioners. In the process of developing the SAPFACT procedure, the interview transcripts were scrutinised to identify aspects and factors that are important in irrigation farming. These aspects and factors differed in detail from the original semi-structured interview guidelines. The way in which they are utilised in presenting the results of the survey is discussed in section 4.3.

4.2 EMERGING TRENDS

4.2.1 FARMER

As was to be expected from the selection procedure, some of the farmers interviewed were very successful indeed. At the least, farmers were reasonably successful.

It was clear that farmers have different attitudes and different approaches at different phases in their farming careers. The older farmer tends to be more conservative. This appears to be because some farming goals have been achieved. Farm development and improvement have often involved substantial investment, not only in material terms, but also in terms of personal effort and commitment. Mistakes are costlier, and the chances of recovery in the event of serious misjudgment are slimmer. Furthermore, patterns of farm management are more entrenched. Younger farmers who have less to lose are probably prepared to risk more. But there is a greater realism in the goal-setting of older farmers. There is a striking consonance between the tendencies revealed in the interviews and the phases and patterns of farm and farmer development and succession identified and formalised by Boehlje and Eidman (1984). They state that "the firm frequently exhibits a life-cycle that parallels the life-cycle of the farmer entrepreneur. The farmer and the firm will pass through at least three stages during the operator's farming career: the entry stage, the stage of growth or survival (alternatively, expansion or consolidation) and, lastly, the exit or disinvestment stage."

The farmers were well educated, most of them having some form of tertiary education. Most common was training at an agricultural college. However, it was on-farm training, generally acquired during a period of early tutelage on the family farm, that was valued most highly. A corollary to the on-farm training through practical experience was an early commitment to farming. Farmers feel a degree of incapacity or inadequacy where either element of training (formal education or on-farm training) is absent. A farmer in Natal noted the absence of suitable agricultural training at different levels. The University and Cedara have rigorous selection procedures. Those who are not admitted have few alternatives in the region.

4.2.2 Household

Household structure and composition was revealed as a significant factor in understanding management styles and practices, and decision-making processes. In a very significant number of cases, wives played a key role in the running of the enterprise. Most common was for the wife to contribute in the arena of finances, by way of record-keeping and management of wage schedules. In cases where the farmer was considering computerisation, it was often the wife who would be taking computer courses and/or managing the transition from manual systems. In some cases, the wife's involvement was at an even more nitty-gritty level of everyday management. The wife of a citrus farmer in the Nkwalini valley was, for instance, entirely responsible for the management of the packhouse. Sometimes the wife has a lucrative farming sideline (beekeeping, for example). There is no doubt that wives play a role in decision-making, even though this may be from a subordinate position. The quite distinctive gender division of labour which was observed on the majority of these irrigation farms was reflected in the Natal case by the common practice of presenting the farm as a joint (husband/wife) enterprise. Despite involvement in the enterprise, the farmer's wife is still a housewife. The time-consuming task of getting children to school was mentioned by several farmers. The way in which the gender division of labour is structured within the farm household reflects the structuring of the gender division of labour in the wider society, where women traditionally perform secretarial and lower-level management tasks, and where they are still, above all, housewives.

The involvement of sons in the farm enterprise was very common. This strongly suggested that the pattern of early on-farm training followed by inheritance, which was observed in the case of current farmers, was in the process of being replicated in the next generation. In some instances, the inheritance pattern, which might tend to split farms into smaller units, had been countered by the setting up of close corporations. One partner and his family run the farm in regular consultation with the other partners. Both family involvement in the enterprise and the close corporation structure complicate the decision-making process. However, there is a strong tendency for the male head of the on-farm household to be the senior partner and the key decision-maker.

A scrutiny of family roles in the farm enterprise reveals that intrahousehold relations which are socially determined impact on economic behaviour. There is thus a potential danger in assuming that decisions are made by a single individual, the "farmer".

4.2.3 Farming Enterprise

The farms visited were multi-enterprise irrigation farms, and nearly all the farmers interviewed had inherited their farms. In some instances, the farmers were the third or fourth generation on the

land. That there was a core enterprise in the family had clearly been a key element in the farmers' ability to keep head above water in what was generally felt to be a tough economic climate. The heavy component of own capital from the outset was thus extremely significant.

There has been a general tendency to expand from the inherited base. Once the basic infrastructure and management have been set up, the farmer has been able to look at other possibilities. Farmers have bought or rented land to supplement the existing holding, depending on what sort of opportunities arise in their particular localities. A few farmers appear to have speculated further afield more widely, but this does not seem to be the common practice. Renting of land occurs in the less prosperous areas where the process of attrition is occurring more rapidly. This is where a rental market in land tends to appear which the successful farmer can take advantage of. The most notable example of this, among the areas initially selected, was Groblersdal. The system of inheritance, where a farm is split between sons, may bring land onto the market which can then be purchased by farmers who have an eye to new opportunity. The farmer in the Umhlali area on the Natal North Coast had purchased a third portion of a neighbouring farm, inherited by a man not interested in becoming a farmer.

4.2.4 History and Role of Irrigation

Irrigation had a long history on all the farms visited. The broad historical trend was for an initial phase of flood irrigation to have been followed by a transition to sprinklers. A third phase typical in the evolution and development of most of the irrigation systems has been a partial shift to more modern systems (for instance, microjets). Most irrigation systems are a mix of two or three irrigation technologies. Farmers have fairly tough-minded views on the merits and demerits of these technologies — views which are grounded in experience and practical comparison.

All but one of the farmers interviewed were farming under full irrigation. There was one case of part-irrigation. The irrigated crop (tobacco) had enabled this farmer to expand in ways which would have been impossible in the absence of the high returns on a high-value irrigated crop. A relatively small irrigated area had been the financial backbone of the farm for two decades. There was one case of supplemental irrigation where irrigated pastures were the foundation for a beef enterprise, although the farmer also grew cabbages as a way of making quick returns on a favourable market. On the fully irrigated farms, enterprise mixes tended to show a broad local consistency. For instance, the combination of cane and citrus was the common pattern in the Nkwalini Valley in Natal. The relative weights of irrigated enterprise on the farms was a phenomenon closely linked to market character and opportunity, and to market responsiveness, although experience and management style also have a lot to do with this. Further comment is therefore offered below.

It may have been coincidence that the farmers selected for testing the interview technique had inherited their farms, and were managing to prosper, or at least to survive, in a tough economic climate. It might be argued that these are not typical irrigation farmers. However, it may well be that these are, and will be, the significant irrigation farmers. Perhaps their significance should be more sharply recognised in the planning process. And perhaps attention should be given to ways in which their management skills can be improved.

4.2.5 Reasons for Farming — Farming Objectives / Philosophy

The early commitment to farming affirmed by most farmers interviewed has already been mentioned. Most cited the way of life as a key reason why they had wanted to farm in the first place, and as a reason why they continued to do so. Some farmers were quite explicit about their aversion to urban life. Capital appreciation was another significant factor which influenced people to continue farming. Farming was perceived by some as having provided adequately for family needs, including the education of children. It was clear that people are not necessarily looking for high incomes in the first instance. An often-cited reason for the choice of farming as a career was that the diversity of activities made it interesting. Farming was perceived to offer an unusual challenge in that it comprised a wide range of activities, demanding a great diversity of skills and capacities. The motivations for farming expressed by individual farmers are interestingly corroborated at a broader level, in De Klerk's analysis of the crisis in South African agriculture. He asserts that "Were net real return on owners' equity the sole criterion, the average farmer would have been well advised to sell up and reinvest in another sector. In practice, for most farmers, hidden returns in the form of salaries received out of current income, lifestyle and the nominal appreciation of capital assets accompanying inflation were sufficient attraction to retain their investment in agriculture" (De Klerk, 1991).

4.2.6 Management Styles and Objectives

Discussion with farmers reveals the complexity of the management process. Because farm management has a number of components, a good farmer requires a large range of skills. Different mixes of capacities, skills and interests make for differential levels of management across the components of the farm enterprise. In one case, sophisticated inter-personal skills might make for a particular bent in personnel management and labour relations. In another, technical sharpness might be reflected in conscientious use of scheduling aids, a close monitoring of water use, and high standard of irrigation management generally. Even amongst the relatively homogeneous group of farmers interviewed thus far (homogeneous in terms of stability and financial standing), it was possible to distinguish different orders of management. Very few could be described as outstanding managers, in the sense that they based their decisions and judgements on the best available technical information and expertise. There was a significant reliance on past experience, gut feel and local rule of thumb, particularly with regard to irrigation management. Where there is a large component of own capital from the outset, reasonable competence in management, while not yielding the best possible results, seems to be quite good enough, not only to survive, but to make a more than adequate living. Two farmers, who appeared to be forward thinking in a number of spheres, expressed the view that being a good farmer requires the same skills as being a good businessman.

Meticulous record-keeping, while undeniably important, does not in and of itself appear to be an absolute criterion of good management. Nevertheless, record-keeping was regarded as important by most farmers interviewed. On the whole, records are kept manually, although quite a number of farmers are considering computerisation, or are in the throes of implementing it. The role of farmers' wives in this aspect of management has been commented on. Computerisation is conceived of, in the first instance, as an aid in basic bookkeeping. However, even where this degree of computerisation has been implemented, the traditional reliance on the services of an accountant remains the order of the day. The use of computer programmes for crop and water management appears to be situated on higher rungs of the computerisation ladder.

Useful questions can be posed in relation to the introduction of computerisation. What sort of advice are farmers getting with regard to the acquisition of hardware and software? What software is available? The impression from the interviews is that all this is pretty ad hoc at the moment, with the exception of the sugar industry. The Sugar Experiment Station has devised a programme called PC Cane Farms, castigated as user-unfriendly by an erstwhile farmer/agricultural consultant, but appreciated by one of the cane farmers interviewed. A key sociological question is: if it is wives who are becoming computer literate for the purposes of record-keeping, how transferable will these computer skills be to other aspects of the farm enterprise, given that the gender division of labour tends to exclude women from the spheres of crop, resource, and input management? Another key question is: what mechanisms and channels can be devised for farmer education in sophisticated management techniques and procedures?

Most farmers were obviously planning ahead. Forward planning is evidenced by clear trends towards changes in the enterprise mix. This requires medium-term planning at least. A corollary to this is that most farmers appeared to have some gut feel for new opportunities. However, not many farmers had gone in for proper soil surveys, although this was a key element in the forward planning of one particularly progressive farmer who was expanding his production of soft fruits.

Successful management clearly consists of a plethora of different skills vested in the individual farmer. However, the role of individual agency should not be overemphasised. The significance of intrahousehold and family relationships in the organisation of farm production has already been touched on. The material conditions (social, economic and political) within which the farmer must operate also impact very significantly on internal farm organisation. Farm enterprises are always subjected to varying degrees of market pressures and market discipline, and it is only in terms of this that efficiency can finally be understood and assessed. Furthermore, agricultural production is always an historically specific phenomenon. The historical specificity of South African agriculture is only too evident in patterns of land distribution and the character of labour relations. The topical issue of farm labour illustrates more graphically than anything else how political and social change can impact on the internal dynamics of farm production. Farmers are being forced to think about labour relations in entirely new ways. This dimension of farm organisation and management is elaborated in paragraph 4.2.10.

What are the circumstances under which management stress occurs? Two examples of extreme management stress emerged in these interviews, the causes of which were unsurprising. In one case, the farmer had overreached himself through too rapid expansion. This placed heavy strain on family relationships. In the other, a bitter period of financial pressure, consequent on a large bond taken for development purposes, ended in sale of the enterprise. The shadow of failure had been enough to prompt a fairly drastic course of action.

4.2.7 Irrigation Development and Management

Most farmers followed technological development and the characteristic approach to irrigation management was informed by hard experience and gut feel. Older farmers felt that the knowledge and reliability of the suppliers of irrigation equipment had improved over time. However, it is still possible to make very serious errors through being given poor advice, or by buying on price. One farmer commented that buying cheaply inevitably turns out to be an expensive option. He had burnt his fingers badly.

Some farmers who had installed microjets expressed a degree of scepticism about these systems. The tendency to clogging was one irritating management-complicating feature and, aside from the apparent farmer reluctance to add to the burden and complexity of management, there was a fundamental doubt about the superior merits of microjets from a production point of view. A Transvaal farmer, insisting that a citrus tree needed a prescribed amount of water at a certain stage of growth, asserted that it was irrelevant whether this was delivered by the basin method or by using microjets. A Cape wine farmer felt that the use of microjet systems involved a fundamentally unnatural mode of water application, while a Natal citrus farmer considered the expense to be unwarranted, particularly since his prior experiences had not convinced him that the system had any advantages. These views are interesting because they reflect the way in which experience, a faith in basic common sense, and a reluctance to incur management problems inform decisions about what technology to install. In fact, the selection of an irrigation method and of equipment is deeply influenced by management factors. Reduction of management stress and load is a key consideration for farmers. It is often difficult for engineers to accept farmer perspectives in this regard, citing examples of successful farmers, and castigating the rejectors, labelling them inefficient. However, it is important that the farmer perspective on the management component of irrigation equipment be respected.

Farmers who are in the process of changing the enterprise mix — for example, those Natal farmers increasing the hectarage of citrus relative to cane — are in the throes of making necessary changes to their irrigation systems. Obviously, the unsuitability of existing technology to a new crop means additional expense and trouble in establishing that crop. None of the farmers interviewed appeared to be put off by this. However, the limitations of existing systems could well be a constraint on market responsiveness.

4.2.8 Investment / Input Costs / Markets / Risk

On the issue of risk, it was clear that, although irrigation obviates some risks, it introduces others. For irrigated farmers, the risk is not so much crop failure (i.e. a production risk). It is risk which is introduced as a consequence of high levels of investment. High investment results in increased vulnerability to market and price fluctuations. Although yields are high, the risk of disease is intensified, particularly where farmers are growing high-value sensitive crops.

Many of the farmers interviewed were moving into high-value export crops. Returns on these crops are very high relative to food grains and other staples. Farmer responsiveness to market signals was thoroughly confirmed by the many instances of changes in enterprise mix which were being effected.

Although most farmers were clearly market responsive with regard to enterprise choice (showing a penchant for profit maximisation), they also made calculated and careful decisions which involved hedging their bets on a new activity (evidencing a strong modification of the profit motive in the form of risk-aversion).

Thus, although the farmers would readily take a risk on a new venture, the risk would be taken on the basis of retaining a substantial interest in a tried and tested enterprise which often had a guaranteed market, and which provided a secure foundation for the enterprise as a whole. In other words, these farmers were not prepared to go out on a limb. The relationship between a new enterprise and an old one was not so much one of cross-subsidisation, as one where the latter

provided a stable basis for the former. In other words, the crucial dynamic is a trade-off between profits and security.

What the discussions of changes in enterprise mix highlighted was the importance of the transition mechanisms adopted by farmers. The retention of a stable production option to offset the risk of the new option appears to be the important element in a successful transition strategy. Transitions may be simpler or less risky where the farmer is moving into production for a market guaranteed by contract or by quota

It is crucial not to underestimate the influence on decision-making and risk-taking of both dimensions of farming pointed to by Boehle and Eidman (1984). It is not only the production or business dimension which has an influence, but also the consumption or way of life dimension. There is no doubt that considerations such as provision of education for children, and the maintenance of a culturally defined standard of living, will affect the decision-making process.

4.2.9 FINANCES

The estimates of capitalisation provided by the farmers ranged between R2 million and R5 million. A turnover of roughly R1 million seemed fairly characteristic. Profitability varies dramatically from crop to crop.

Only one of the farmers interviewed could be described as a part-time farmer. He was a full-time lecturer at a local technikon. His monthly income contributed vitally to the family's sustaining a required standard of living. His wife played a key role in running the farm. No-one else had a significant source of off-farm income. Farmers said that the enterprise was too time and energy consuming to permit of substantial outside interests. A few had invested in shares, but the aim was to achieve longer-term security rather than to develop a substantial alternative business interest. The group of farmers interviewed thus far may be atypical in this regard.

4.2.10 LABOUR / ORGANISATION / TRAINING / LEGISLATION

A key issue which was broached with farmers regarding labour was the strong likelihood of new legislation's governing conditions of employment. Most said that they did not have grave misgivings about the forthcoming legislation. Many expressed the view that they had already "put their houses in order" with regard to conditions of employment on their farms. In the absence of a more in-depth investigation, it would be impossible to comment on this opinion. The farmers' apparently positive approach was somewhat belied or contradicted by the grave fears which were expressed about the "unreasonable demands" which might come from a unionised labour force through union representatives. Union representatives tended to be thought of as "outsiders".

A few farmers did express explicit fears about the legislation, or an undisguised antipathy to it. They felt that the relationship between the farmer and his labour force was inherently and necessarily feudal in nature. The word "feudal" was in fact used by one farmer to convey the notion of complex relationships of mutual obligation which could not easily be quantified or disaggregated in contractual terms. The Rural Foundation seemed to have had a substantial impact in some areas, in restructuring and formalising the relationship between farmers and the farm workforce. Farm committees have been set up on a number of farms. These committees represent

the interests of the permanent workforce, and negotiate issues with the farmer and/or his management team.

One or two farmers had made enormous strides in their thinking and practices, not only with regard to the rights and conditions of employment of their labourers, but also with regard to training, and the increased productivity which could flow from a total reconceptualisation of labour relations on the farm. In these cases, the thinking was in terms of entirely new modes of management which would allow space for the creative contribution of workers. Paternalistic and repressive modes of management were rejected as counter-productive. New styles of management would involve co-operation to achieve goals for the enterprise which were mutually understood and agreed on. These odd examples suggest that most farmers have a long way to go in the arena of labour relations, despite the protestations that they make about being ready to meet a new set of circumstance in a positive spirit. Ways of developing management skills which would enable farmers to release the potential of their workers should be considered in planning for increased efficiency in agriculture.

4.2.11 THE FARMING COMMUNITY

Many of the farmers interviewed commented that their local communities were small and close-knit. Most farmers belong to farmers' associations which play an important role in organising seminars and workshops. The benefits of belonging to an association are appreciated. One farmer commented on the protection that association membership offered in a situation where a farmer had been sold inadequate or overpriced equipment. The association would act on the farmer's behalf. Furthermore, the closeness of farmer communities does check possible supplier or dealer malpractice. To alienate one farmer is to alienate a whole community, and thus to destroy a potential market. A Natal farmer commented that the worst thing that could happen to a supplier was for word to get out that he had given a farmer in the area a raw deal. What the discussions with farmers also revealed is the extent to which membership of associations influences decision making on the individual farm. Farmers associations are a forum for discussion, not only of common interests, but also of production and management options. Farmer study groups may have an even sharper influence on decision-making. One farmer mentioned that the study group he belonged to had been considering the pros and cons of avocados.

4.3 ANALYSIS OF INTERVIEW TRANSCRIPTS

In the process of developing an approach to analysing open-ended interviews, an effort was made to organise the data into logical groupings for further analysis. These groupings were derived from the original interview guidelines and consist of six main aspects, each made up of eight factors, giving a total of 48 factors in all. The aspects and factors were subjectively derived, and can be modified to suit the purposes of the researcher.

The 48 factors provide a vehicle for entering, presenting and evaluating the results of the surveys. In this report, the presentation is done in two ways:

Firstly, SAPFACT incorporates a "help function" for each factor consisting of short "prompts" derived from the perspectives gained from the surveys, which are incorporated in Chapter 5.

Secondly, a "profile" was developed for three of the main irrigation areas in which surveys were

undertaken, and a general summary of the applicable information was given for each of the 48 factors. This provides a background against which it is possible to assess the "profile" of individual farmers developed by SAPFACT (see Chapters 6–9).

The six main aspects, each with their eight factors, are the following:

4.3.1 Irrigation Management Aspect

The factors considered under this aspect can be grouped under physical and personal and decision factors. The physical factors include a) equipment operation and maintenance, b) equipment design and installation, c) annual water supply and d) delivery of water. The personal factors are e) farmer's understanding of irrigation principles and f) farmer's attitude towards water management leading to the decisions taken in regard to g) suitability of irrigation methods and h) scheduling practices.

4.3.2 Crop Profit Potential Aspect

The natural resources factors a) suitability of soil, b) suitability of climate and c) alternative crop possibilities are determining factors. The management factors d) crop yields and e) production and establishment costs determine the income factor f) gross margin potential. In assessing the farm, the two risk factors g) market/price risk and h) production risk must also be considered.

4.3.3 General Management Aspect

The two supervision factors a) supervisory support and b) personal supervision are pointers to efficiency while the management factors are c) seasonal planning and d) record-keeping. The knowledge factors are e) counselling and advice and f) training and experience. Operational management factors are g) management structures and h) long-term planning activities.

4.3.4 Labour Management Aspect

The factors which are related to present labour relationships are a) labour: on-farm organisation, b) labour situation c) attitude to legislation and d) remuneration (cash and kind). Factors concerned with the upgrading of the labour force are e) development actions and f) training inputs. The factors which indicate the effectiveness of the labour force are g) contribution to efficiency and h) contribution to supervision.

4.3.5 Farmer Situation Aspect

Factors that indicate a farmer's motivation are a) farming way of life and b) career stage. Factors that give some indication of the farmer's attitude to his position are c) property plans and d) approach to decision-making. Factors that indicate how the farmer is coping generally are e) stress and f) personal and family aspects. Factors that can influence people relationships are g) support provided by wives on farm and h) community involvement.

4.3.6 Financial Aspects

The factors providing some indication of the level of financial administration are a) accounting services and b) credit rating. Medium-term factors are c) access to income and d) impact of inflation. Long-term factors are e) marketability of farm and f) bond status. Factors that give some indication of the viability of the enterprise are the g) scale of operation and h) income aspirations.

CHAPTER 5

THE SAPFACT MODEL FOR INTERPRETING INTERVIEW INFORMATION

5.1 INTRODUCTION

This chapter examines a proposed model for interpreting the information gained from semi-structured personal interviews. In the course of discussions with irrigation farmers, a great deal of information about the farm, the farmer and his irrigation practices was gained. In this respect, semi-structured personal interviews proved to be valuable.

The interviews made clear that an extremely complex range of interrelated factors influences irrigation farming, something that quantitative research methodologies have not always revealed. This is probably due to the human aspects of many of these factors, which are dependent on the personalities, background and education of the farmers. It is difficult to quantify such factors because they are unique to each farmer.
The general impressions gained in the course of the surveys have been discussed in earlier chapters. It was found that it was not always easy, however, to sift through the interviews and classify and interpret the information. So a method was sought by which practitioners not trained in quantitative research could analyse and present the data.

In practice, interviews of this nature would be undertaken to facilitate farmer counselling, to advise on equipment needs and management, or to develop advisory or research programmes. A relatively simple method of analysis, developed to assess the success potential of a new product in industry, made it possible to assess the contribution of human and technical factors in irrigation farming on an equal level (Rouse, 1991). The method is based on integrating the separate factors that contribute to the overall success potential of the irrigation farm. It therefore becomes possible to identify very specifically which problem areas are preventing, or limiting, the success of farmers. By focusing on specific factors, one can develop recommendations for improved equipment and methods, or ensure that counselling strategies focus on the necessary issues.

As was noted in Chapter 4, the interviews identified six broad aspects that can contribute to assessing the overall situation. These are:

- Irrigation management status,
- Crop profit potential,
- General management status,
- Labour management status,
- Farmer success potential, and
- Financial aspects.

Each of these broad aspects can be broken down into eight contributing factors identified in Chapter 4, both internal and external, human and physical, emotional and technological (see paragraphs 4.3.1 — 8).

The method adopted is first illustrated by example in Section 5.2, after which a computer program, SAPFACT, is presented in Sections 5.3.1—6. SAPFACT is intended to assist practitioners in analysing and presenting qualitative data for technical investigations, even if they have not been

subjected to the rigorous training received by professional qualitative researchers.

SAPFACT can also be utilised to develop "profiles" of irrigation farmers in terms of specific characteristics. In order to illustrate this procedure, farmers interviewed in the course of this project have been evaluated utilising the program. These profiles are introduced in Chapter 6.

5.2 THE METHOD OF ANALYSIS — IRRIGATION MANAGEMENT STATUS EXAMPLE

The first aspect, Irrigation Management Status, is used as an example to illustrate the SAPFACT method of analysis. In paragraph 4.3.1, the eight factors that have been identified as having an influence on this aspect are grouped under the four Physical Factors concerned with irrigation equipment and water supply, and four Personal Factors associated with the farmer's knowledge and attitudes and consequent decisions and actions. The analysis procedure utilised in SAPFACT, derived from Rouse (1991), permits the progressive blending of the factors and the derivation of an integrated rating of the Status of Irrigation Management on the farm.

5.2.1 STATUS: THE "PHYSICAL" FACTORS

5.2.1.1 Position: Irrigation Equipment — Equipment Design and Installation / Equipment Operation and Maintenance

To illustrate the SAPFACT method of analysis, consider the case where the status of irrigation management is to be assessed on two neighbouring farms, one farmed by Smith and the other by Jones (see Table 5.1). Both farmers are interviewed using the semi-structured interview technique. No specific questions are asked but, as is usual, the interviewer had at the back of his mind a "list" of factors that would contribute to an understanding of the irrigation management situation. He wanted to gain an impression of the position with regard to equipment operation and maintenance, which is under the control of the farmer, and of the quality of the original design and installation of the system, which must be accepted "as is" unless expensive modifications are to be undertaken. Combining these aspects will provide an indication of how satisfactory, or unsatisfactory, the position is in respect to irrigation equipment.

The model is based on weighted rankings but, in line with qualitative procedures, the user does not rank on a quantitative scale. Rather he is asked to select the qualitative statement which reflects the position best.

The columns in Table 5.1 reflect the Equipment Operation and Maintenance Factor, where Smith was considered to be "disorganised" (column 2) and Jones "passable" (column 3). The rows represent the Design and Installation Factor; here Smith was "acceptable" (row 3) and Jones "very good" (row 4). By combining the two factors, their positions in regard to Irrigation Equipment as a whole is indicated by their "star" rating, which can be broadly interpreted as being unsatisfactory (one star), marginal (two stars), reasonable (three stars) or satisfactory (four stars). This is based on the ranking allocated to each square of the table. The values are established by subjective judgement and can be modified in the light of experience.

TABLE 5.1 POSITION: IRRIGATION EQUIPMENT

EQUIPMENT DESIGN AND INSTALLATION — ROW		NEGLECTED	DISORGANISED	PASSABLE	EFFECTIVE
4	VERY GOOD	• •	• • •	Jones • • •	• • • •
3	ACCEPTABLE	• •	Smith • •	• • •	• • • •
2	BORDERLINE	•	• •	• • •	• • •
1	INFERIOR	•	•	• •	• • •
COLUMN		1	2	3	4

EQUIPMENT OPERATION AND MAINTENANCE

The equivalent rating values are:

Unsatisfactory —	*rating* 1	•
Marginal —	rating 2	• •
Reasonable —	rating 3	• • •
Satisfactory —	rating 4	• • • •

Jones ranked • • • • (satisfactory) at column 3 for Operation and Maintenance and row 4 for Design and Installation, while Smith was not in as good a position: • • (marginal) at column 2 for Operation and Maintenance and row 3 for Design and Installation. This shows that the best equipment operation and maintenance cannot compensate for a poor system, while a good system can be ruined by operational neglect. Smith's position can be improved by better operation and maintenance.

5.2.1.2 Position: Water Supply — Annual Water Supply / Delivery of Water

Even if all is well with the irrigation equipment, this will be of little value if the water supply position is unfavourable. This is evaluated in Table 5.2, where the columns represent the Annual Water Supply Factor: Smith had an "assured" supply (column 4) while Jones had a "reliable" supply, (column 3). An assured water supply is not sufficient if the farmer has difficulty in getting water when he needs to irrigate so one also needs to take into account how water is delivered. The Delivery of Water to Smith was on a regular basis (row 3). Jones was less fortunate; deliveries via the canal were irregular (row 2).

Once again, we combine the factors to arrive at a measurement of the position. This time, Smith is in a • • • • (satisfactory) position at column 4, row 3, while Jones is • • • (reasonable) at column 3, row 2. We have the anomaly that the positions are now reversed: Smith's water supply position is satisfactory but his equipment situation is marginal, while, in the case of Jones, his equipment is satisfactory but his water supply is only reasonable.

TABLE 5.2: POSITION: WATER SUPPLY

DELIVERY OF WATER	ROW					
	4	ON-DEMAND	• •	• • •	• • • •	• • • •
	3	REGULAR	• •	• •	• • •	Smith* • • •
	2	IRREGULAR	•	• •	Jones * • •	• • •
	1	ERRATIC	•	•	• •	• • •
			INADEQUATE	UNRELIABLE	RELIABLE	ASSURED
		COLUMN	1	2	3	4

ANNUAL WATER SUPPLY

5.2.1.3 *Status: Water Supply and Equipment*

In order to assess the combined status in respect of the two "physical factors" of Irrigation Equipment and Water Supply, the above results are transferred to Table 5.3. The derived ranking *for the Water Supply Position, from Table 5.1, is transferred automatically to the columns, while* the derived ranking of the Irrigation Equipment Position is transferred to the rows.

Jones, at column 3 for Water Supply and row 4 for Irrigation Equipment, is in a stronger position with a satisfactory ranking (* * * *) because he has satisfactory equipment and is managing it well, although he is suffering because his water delivery is only reasonable. (It may be corrected in the near future by improvements to the Irrigation Board's river control system.)

Smith, at column 4 for Water Supply and row 2 for Irrigation Equipment, has only a reasonable ranking (* * *) because, although he has a satisfactory water supply, his eqipment is only marginal, so that more attention to operation and maintenance should pay dividends.

TABLE 5.3: STATUS: WATER SUPPLY AND EQUIPMENT

POSITION: IRRIGATION EQUIPMENT	ROW					
	4	• • • •	• •	• • •	Jones* • • •	• • • •
	3	• • •	• •	• •	• • •	• • • •
	2	• •	•	• •	• •	Smith* • •
	1	•	•	•	• •	• •
			•	• •	• • •	• • • •
		COLUMN	1	2	3	4

POSITION: WATER SUPPLY

5.2.2 STATUS: THE "PEOPLE" FACTORS

5.2.2.1 *Position: Approach to Irrigation — Attitude to Water Management / Understanding of Irrigation*

The farmer's Approach to Irrigation must be considered in addition to the physical factors we have discussed. It is assessed in Table 5.4. The impression gained of the farmer's Understanding of Irrigation is classified in the columns: Smith was regarded as having *"limited" understanding*, while Jones was one step up at "reasonable". Attitude to Water Management is reflected in the rows, where Smith had a "favourable" attitude, while Jones was regarded as being "neutral". Once again, it is possible to combine the two factors and come up with an assessment of the farmer's approach to irrigation. Smith is rated * * (marginal), while Jones has a * * * (reasonable) approach. It is easy enough to establish where counselling would be desirable.

TABLE 5.4: *POSITION: APPROACH TO IRRIGATION*

ATTITUDE TO WATER MANAGEMENT — ROW		NEGLIGIBLE (1)	ELEMENTARY (2)	REASONABLE (3)	COMPREHENSIVE (4)
4	CONSTRUCTIVE	* *	* * *	* * * *	* * * *
3	ACCEPTABLE	* *	Smith * *	* * *	* * * *
2	NEUTRAL	*	* *	Jones * * *	* * *
1	NEGATIVE	*	*	* *	* * *

UNDERSTANDING OF IRRIGATION

5.2.2.2 Position: Methods and Scheduling — Suitability of Irrigation Methods / Scheduling Practices

The Suitability of the Irrigation Methods for the circumstances pertaining on the farm are reflected in the columns of Table 5.5. Smith's irrigation methods were rated as being "adequate" while Jones' are "appropriate". The rows rate the scheduling practices being applied. Smith's scheduling is "intuitive" but Jones has a sound "practical" technique. The overall rating of their Methods and Scheduling is Smith * * * *(reasonable)* and Jones * * * * *(satisfactory)*.

TABLE 5.5 POSITION: METHODS AND SCHEDULING

SCHEDULING PRACTICES — ROW		UNSUITABLE	BORDERLINE	ADEQUATE	APPROPRIATE
4	SCIENTIFIC	• •	• • •	• • • •	• • • •
3	PRACTICAL	• •	• •	• • •	Jones • • • •
2	INTUITIVE	•	• •	Smith • • •	• • •
1	RULE OF THUMB	•	•	• •	• • •
COLUMN		1	2	3	4

SUITABILITY OF IRRIGATION METHODS

5.2.2.3 Status: Irrigation Know-how — Approach to Irrigation / Methods and Scheduling

Table 5.6 provides an overall rating of the farmer's Irrigation Know-how Status, which combines Table 5.4 and Table 5.5 and results in the classification of Smith, at column 3 for Methods and row 2 for Irrigation, as * * (marginal) and Jones, at column 4 for Methods and row 3 for Irrigation, as • • • • (satisfactory).

TABLE 5.6 STATUS: IRRIGATION KNOW-HOW

POSITION: APPROACH TO IRRIGATION — ROW					
4	• • • •	• •	• • •	• • • •	• • • •
3	• • •	• •	• •	• • •	Jones • • •
2	• •	•	• •	Smith • •	• • •
1	•	•	•	• •	• •
		•	• •	• • •	• • • •
COLUMN		1	2	3	4

POSITION: METHODS AND SCHEDULING

5.2.3 *Status: "Physical" plus "People" Factors*

The Physical Factors and the People Factors have now been assessed and the eight original factors have been combined and reduced to two, the **status of Water Supply and Equipment** and **Irrigation Know-how**. All that is left to do is to combine these elements to establish the **Status of Irrigation Management**. Table 5.7 shows how this is achieved, in what should now be a familiar exercise. Smith, at column 3 for Water Supply and row 2 for Irrigation Know-how, rates * * (marginal), while Jones, at column 4 for Water Supply and row 4 for Irrigation Know-how, rates * * * * (satisfactory).

TABLE: 5.7 STATUS: IRRIGATION MANAGEMENT

STATUS: IRRIGATION KNOW-HOW — ROW	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
4	* * * *	* *	* * *	* * * * Jones
3	* * *	* *	* *	* * *
2	* *	*	* *	* * * Smith
1	*	*	*	* *
	*	* *	* * *	* * * *

STATUS: WATER SUPPLY AND EQUIPMENT

5.3 SAPFACT: THE SIX ASPECTS

The way in which SAPFACT condenses the procedure outlined in section 5.2, applicable to the aspect of irrigation management, to a single screen is illustrated in Figure 5.1, which reflects Smith's position and Figure 5.2, which applies to Jones.

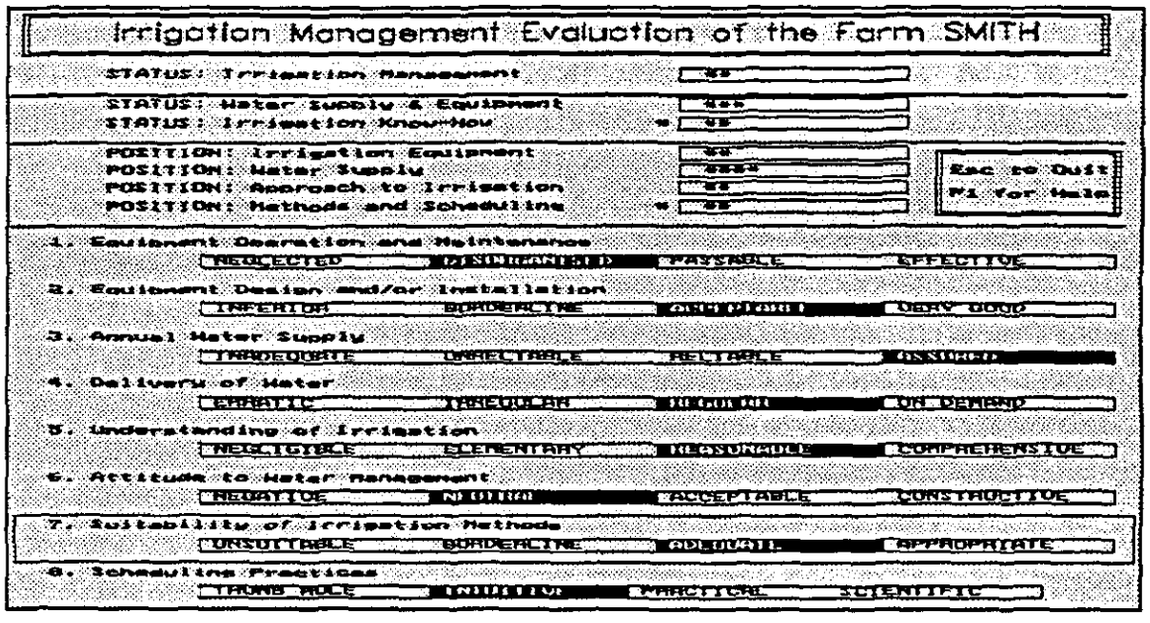

FIGURE 5.1 STATUS: IRRIGATION MANAGEMENT: FARMER SMITH

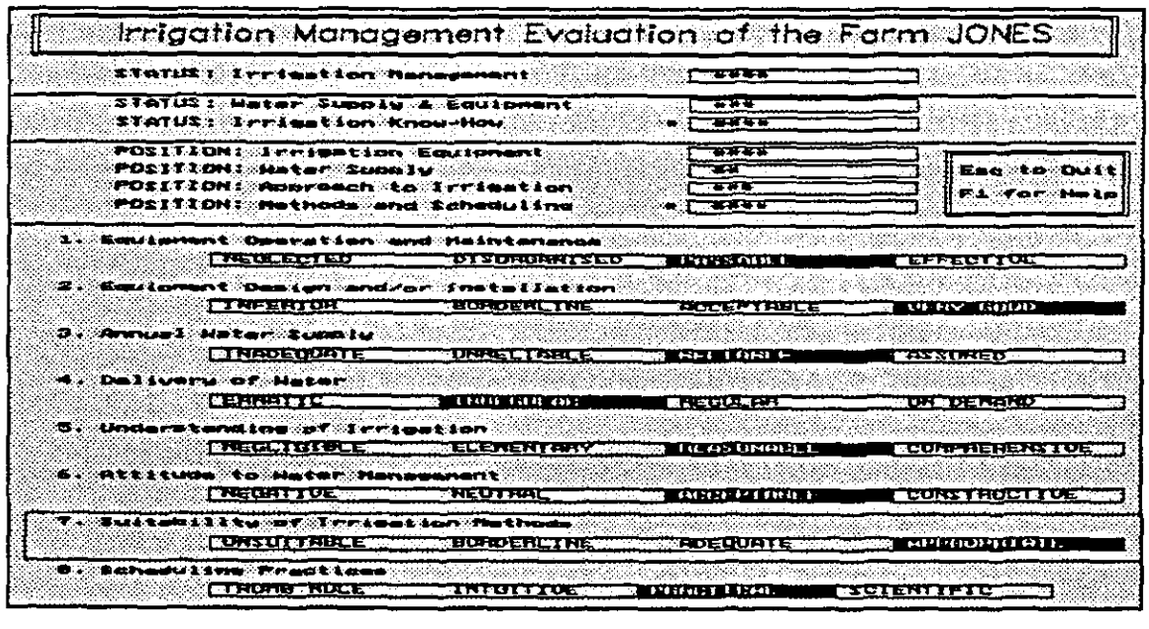

FIGURE 5.2 STATUS: IRRIGATION MANAGEMENT: FARMER JONES

In order to provide for rapid *what-iffing*, each of the factors can be menu selected in the lower part of the screen. The status or position appears in a window in the upper part of the screen.

The selection of the key words is supported by the help functions which provide "prompts" for the contributing factors. These notes are an integral part of the output of the project.

On one computer screen, about twenty lines, they describe the general South African situation for that aspect and give guidelines about what to look for in order to come to an evaluation.

5.3.1 Irrigation Management Aspect: Help Function Notes

5.3.1.1 Equipment Operation and Maintenance

Farms have a surprisingly high level of equipment neglect. Gradual deterioration in performance tends to be unobtrusive and action is only taken when breakdown occurs. Farmers do not always appreciate that worn sprinkler nozzles and pumps and leaking pipe lines can have a direct influence on yield and profitability. Although complete breakdown can have devastating effects, some farmers consider routine maintenance as too expensive.

The more advanced the system, the more attention required. Micro and drip irrigation systems are subject to blockages unless filters are well maintained, and the electric circuits of computer controlled systems are vulnerable. Well informed and motivated labour contributes to the efficient operation of an irrigation system.

Equipment Operation and Maintenance is rated either as neglected, disorganised, passable or effective.

5.3.1.2 Equipment Design and/or Installation

Early sprinkler systems were inferior, partly due to a lack of understanding of the practical realities of irrigation farming. This has led to the trade's favouring a "fail-safe" approach, if this is affordable to the customer. Soil surface sealing and land slopes which cause run-off can vary widely in one area and have a major influence on pivot size and operating pressures. The assumption that conditions do not differ within an area led to "standard" irrigation packages, which was clearly a problem.

Although this has changed, there is a need for more attention to be given to "customising" irrigation designs to specific requirements of farmers in an area.

Farmers appear to be well served by their irrigation equipment dealers, their main advisor on equipment selection, who can call on a wealth of experience, but better understanding of agricultural, economic and engineering aspects is desirable. A scheme may be well designed and specified but the construction of the scheme and installation of equipment may leave much to be desired.

Equipment design and installation is rated as either inferior, borderline, acceptable or very good.

5.3.1.3 Annual Water Supply

All irrigation farmers fear water shortage, as a modest drop in water supply can result in irrecoverable crop losses. Conservatively, water availability should determine the amount of land planted but farmers are prepared to gamble by planting just a little more than the system can and should handle. They would describe their water supply as unreliable.

Historically, water allocations have been based on providing for one annual crop per year on a specified "ingelyste" area. This is inadequate for the modern trends towards the expansion of permanent crops and more intensive cropping patterns. Even in the case of major schemes and irrigation boards, quota cuts are all too common. The long run of dry years has had a serious impact. Several farmers found assured alternative water sources, such as "mountain water", private dams and boreholes, invaluable in times of stress.

It is difficult to stimulate improved irrigation and planning if water supply is diminished, although it is even more important that water supply should be reliable when one is trying to improve irrigation and planning.

Water supply is assessed as **inadequate, unreliable, reliable** or **assured.**

5.3.1.4 Delivery of Water

Ideally, water should be available "on demand", under pressure, and at a delivery rate in phase with irrigation requirements. This is seldom the case,except for private schemes served by a more than adequate source. The inability to have water available as and when required imposes restraints on present and proposed irrigation systems. Most State schemes were designed for flood irrigation and it is difficult to accommodate modern short-frequency irrigation systems, such as centre pivot, micro and drip, within such schemes. This inflexibility leads to water management problems.

Delivery of water is rated as being erratic, irregular, regular or on-demand.

5.3.1.5 Understanding of Irrigation

Many farmers have a negligible understanding of irrigation, largely, it seems, because the technology and complexities of irrigation overwhelm them. This is the major reason for the wasteful use of irrigation water. Farmers who have had direct exposure to "on-farm" irrigation research have a much more reasonable understanding of irrigation than their contemporaries and thus have greater peace of mind. They obtained this training by observation and by applying the experimental plot results to their fields. Counsellors can undertake this necessary training to make farmers' understanding of irrigation comprehensive.

The farmer either has **negligible, elementary, reasonable** or **comprehensive** understanding of irrigation.

5.3.1.6 Attitude to Water Management

Interest in irrigation methods and equipment is low on the priority list of most irrigation farmers. The issues uppermost in their minds relate to what soils they should irrigate, what crops and varieties they should grow, when to plant, fertilisers, insect and disease control and, above all, prices and markets. The negative side of irrigation farming relates to the capital and labour required, the need for chemicals and maintenance of equipment, and coping with irrigation itself. The crop must get enough water or everything else is wasted, but the farmer wants to achieve this in the simplest and cheapest possible fashion. Irrigation is never an end in itself.

Many farmers are neutral, believing that scheduling and programming might be good for saving water but that they have little impact on yield and, consequently, are not worthwhile because of additional management inputs and costs. However, water management does reduce costs, increase yields and improve product quality. This has been constructively demonstrated by top farmers, particularly in the case of high-value crops.

A farmer's attitude to water management can be **negative, neutral, acceptable** or **constructive.**

5.3.1.7 Suitability of Irrigation Methods

The original irrigation systems were flood. This was followed by the development of hand-line sprinkler systems, and up-graded by the introduction of drag-line and side-roll systems. Pivots, which greatly reduce management load, have become commonplace. In the intensive areas, the accent is on micro and drip. Selection is often dominated by management considerations.

There are still appropriate flood systems in operation and even examples of farmers who have left micro and gone back to under-tree sprinkle irrigation. The appropriateness of irrigation method should be judged by results. Costs, yields, labour, product quality and management are all important factors to consider.

Irrigation methods can be **unsuitable, borderline, adequate** or **appropriate.**

5.3.1.8 Scheduling Practices

Long experience allows some farmers to develop an instinct for irrigating the correct amount at the right time for their specific farming circumstances. However, few farmers have the opportunity for developing such intuition and it is therefore vital that scheduling techniques are affordable, easy to use and have obvious results in terms of increased yields and savings. Farmers must give attention to scheduling, but the method needs to be appropriate to their experience and circumstances. The first rung on the ladder is the measurement of water applied, coupled to a pre-programmed table of weekly water requirements (BEWAB or similar). The next is the use of a profit-and-loss system based on A-pan or, preferably, automatic weather station-derived values for atmospheric demand. More sophisticated methods utilise tensiometers or neutron moisture meters, while PC-based real-time scheduling programs (such as PUTIRRI) are especially warranted for high-value crops.

Scheduling practises can be classified as **rule of thumb, intuitive, practical** or **scientific.**

In the detailed example above, we have only dealt with Irrigation Management Status, which is only one of the six aspects that determine the viability of irrigation farming. The inter-related aspects which are included in this specific version of SAPFACT are:

- Irrigation Management Status;
- Crop Profit Potential;
- General Management Status;
- Labour Management Status;
- Farmer Success Potential; and
- Financial Aspects.

In SAPFACT, all the aspects are dealt with in the way illustrated in the detailed example of Irrigation Management Status. There is a SAPFACT screen for each aspect, and a Help Function for each of the eight factors contributing to the evaluation of the aspect. The factors that have been selected for each aspect, and their inter-relationship, are detailed in Figures 5.3 to 5.7.

It will be appreciated that the establishment and definition of the factors, and their relationship to each other, represents a considerable exercise in qualitative research analysis and that the process is by no means mechanistic. Users of SAPFACT can, with experience, modify the aspects, factors and the key words on the menu bars to meet their specific requirements.

We have seen how Irrigation Management Status is developed from eight input factors. The same procedure is followed for the other five aspects. The factors which are assessed, the inputs which are selected on the menu bars, and the hierarchal build-up resulting in the rating of the status of each of the aspects are included in Figures 5.3 to 5.7.

5.3.2 Crop Profit Potential Aspect: Help Function Notes

5.3.2.1 Suitability of Climate

Climate (i.e. conditions of temperature, rainfall, humidity, wind, etc.) is not always ideal for irrigation farming. This can have a negative influence on yield and quality and can increase the risk of crop failure. These factors are important in determining the economic viability of the enterprise. Climate can vary widely over small distances, impacting differently on the crops of neighbouring farms, without the reason's being immediately obvious.

Climatic conditions can range from risky through marginal to suitable and ideal for the crops being farmed.

5.3.2.2 Suitability of Soils

Minimum soil requirements for irrigation farming have been established. Unfortunately, designers and farmers are not adequately informed about the importance of soil when selecting, designing and operating irrigation systems. Surface crusting, which limits application quantities per irrigation, and the reserves provided by deep soils during periods of maximum stress are important factors to consider in the design and management of irrigation systems. Ineffective scheduling is also partly due to a lack of understanding of the importance of soil in these procedures. Soil suitability must be seen in the context of crops, irrigation methods and management practices.

Soils can be assessed as poor, marginal, acceptable or recommended for the crops grown.

5.3.2.3 Alternative Crop Possibilities

Financial and market considerations are causing farmers to experiment with alternative crops to those that have been staples in the past, especially those that offer potential for high or secure profits. This results in farmers' working with crops that they have yet to fully understand, a process that can take several years, and this increases risks. There may not be viable options, as a consequence of climatic and market conditions, in which case the farmer could face a crisis.

A farmer can have successfully exploited no, few, some or several potential alternative crops.

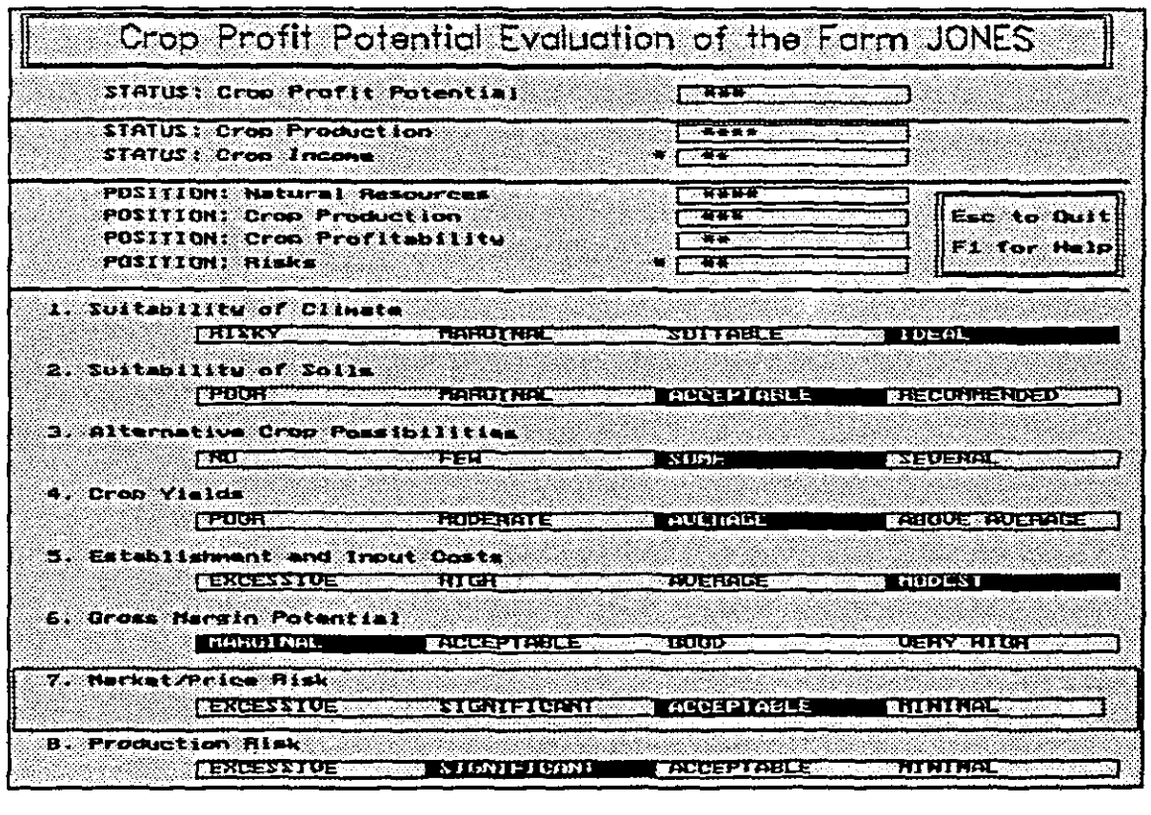

FIGURE 5.3 STATUS: CROP PROFIT POTENTIAL

5.3.2.4 *Crop Yields*

Crop yields are of paramount importance in determining enterprise viability. They are also generally a good barometer of a farmer's ability, and the potential of his farm. Usually, a farmer will indicate, with reasons, if he achieves above or below average yields. Extension officers, the co-operative, and technical representatives can be consulted, if doubts arise.

Crop yields can be rated as poor, moderate, average or above average.

5.3.2.5 *Establishment and Input Costs*

Farmers assess increasing input costs against the potential value of the crops but are often tempted to invest in facilities that promote efficiency and ease the management load at the cost of cash flow problems. High establishment costs are only warranted, provided the crop has a high value and well-above-average yields can be anticipated. At all times, farmers try to keep production inputs as low as possible. Electricity costs for pumping and the cost of transporting bulky crops such as sugar cane appear to increase the financial pressures on farmers enormously. The purchase of capital items or the establishment of new lands or orchards can make the farm vulnerable.

Input and establishment costs must be seen in the light of potential turnover and gross profit, and can range from being excessive through high to average and modest.

5.3.2.6 Gross Margin Potential

It is normally assumed that gross margin is the difference between Gross Production Value and *Directly Allocatable Variable Costs, including permanent labour.*

Irrigation is better suited to the production of high-value specialist crops. The cost of developing and operating an irrigated hectare is much the same, no matter what crop is grown. Farm management is, therefore, subject to restraints if relatively low-value field crops are being produced. The farmer has greater freedom of action if his product has a high value and an assured market, with export potential.

Gross margin can increase from marginal, to acceptable, to good, to very high.

5.3.2.7 Market/Price Risk

Many of the crops which are being produced under irrigation are now facing marketing or price problems. Maize and wheat prices, for example, are dependent on dryland production so that, in times of drought, the irrigation farmer scores, if he predicts the season correctly!

If a farmer is lucky or efficient enough to win a contract for relatively high priced products such as potatoes for chipping, factory tomatoes, beans and peas, sweet- and popcorn, and seed, his position becomes relatively stable but such contracts are limited. Another source of stability is the co-operative production of processed products such as fruit juices. The prices of sugar and wine are no longer as stable as they once were. Citrus, sub-tropical and deciduous fruits are all subject

to the competitive situation in the international market. The vegetable market is also highly competitive and fortunes are made and lost through luck or errors of judgement.

The position can range from excessive through significant to acceptable and minimal.

5.3.2.8 Production Risk

Risk is minimised when well known crops are produced under familiar conditions. When economic circumstances make it necessary to find new crops or to produce four crops in two years, rather than the normal three, risk is increased, especially since high-value horticultural crops demand greater management inputs than field crops.

Production risks can be categorised as being excessive, significant, acceptable or minimal.

5.3.3 General Management Aspect: Help Function Notes

5.3.3.1 Supervisory Support

On labour-intensive, high-technology irrigation farms, the supervision and coordination of activities is a major factor influencing success. While the farmer must accept the final responsibility, support is valuable. On larger farms, this support will be provided by well-qualified managers or members of the family but, on the smaller farms, support is drawn from the ranks of experienced labour.

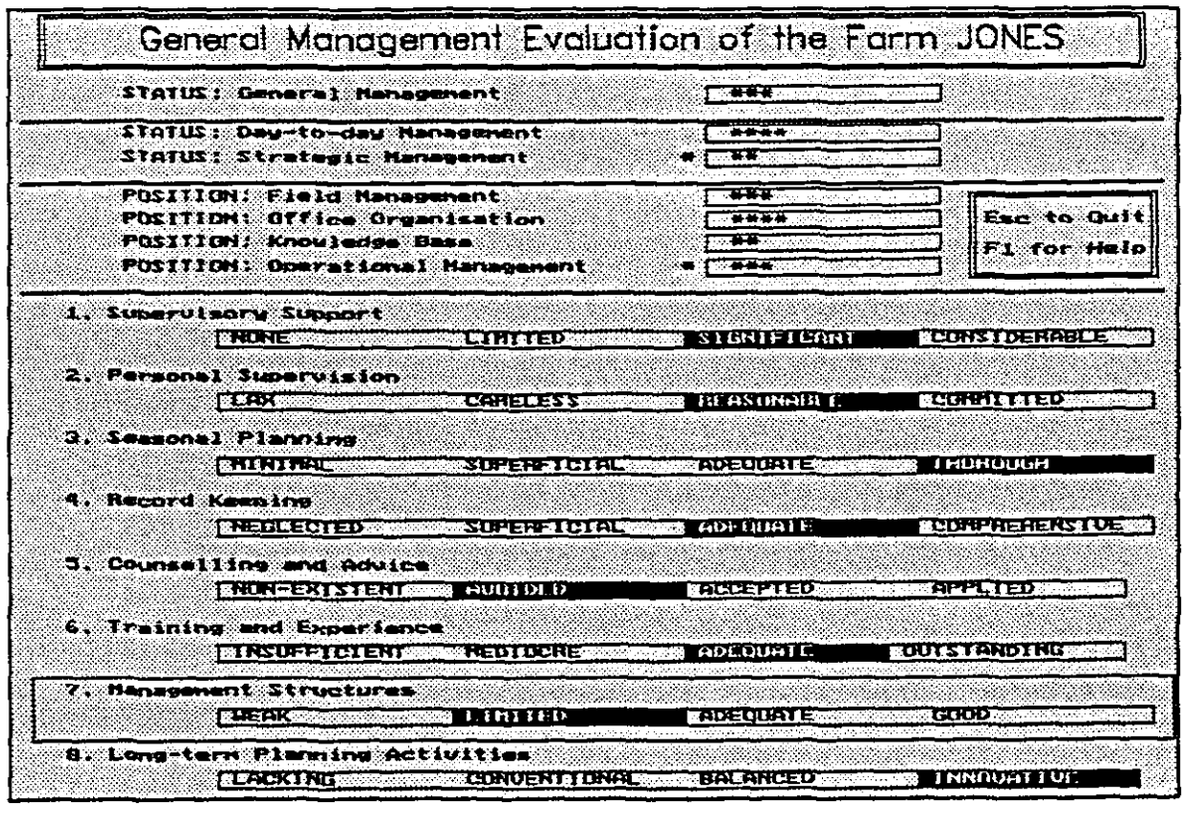

FIGURE 5.4 STATUS: GENERAL MANAGEMENT

These "foremen", if they have received the right training, become part of the management team and can share the supervisory burden.

Supervisory support can be **none, limited, significant** or **considerable.**

5.3.3.2 Personal Supervision

Effective management requires good supervision, particularly in irrigation farming, which is intensive and, like dairy farming, requires constant attention. This is due to the range of tasks that continue throughout the year, the need for constant maintenance of equipment, and the responsibility of having to take decisions at short notice. Attention to detail, and dedicated supervision, are invariably attributes of a successful farmer, who needs to be on hand to make decisions at all times throughout the year. Even if the farmer has support in the form of managers, foreman or family, he will be setting the example and ensuring constant coordination.

Personal supervision can be **lax, careless, reasonable** or **committed.**

5.3.3.3 Seasonal Planning

Farm management suffers to some extent because few farmers appear to base their decisions on the best available technical information and expertise. Rather, they rely on past experience, gut feeling and rule of thumb. Good seasonal planning is very dependent on the availability of good records kept during past seasons. While some farmers, disastrously, leave seasonal planning to the last minute, others do give it attention early enough for the planning to be effective, e.g. six months ahead.

Seasonal planning starts with what to grow and how much, but it should include cash flow, labour, seed, fertiliser and equipment overhauls. By discussing seasonal prospects, neighbours, extension officers, and advisors at the co-operative can help a farmer to plan effectively.

Seasonal planning can be **minimal, superficial, adequate,** or **thorough.**

5.3.3.4 Record-keeping

Good management is not totally dependent on meticulous record-keeping, but farmers should regard it as important. Most farmers use manual record-keeping methods, although many have computerised or are considering computerising their books. The role of farmers' wives in this aspect of management is important as they seem to have the time for the computer training. Many organisations such as the co-operatives, SA Sugar Association and other product-orientated associations provide interactive, computerised record and accounting services for their clients. Most farmers keep good financial records for passing through to accountants but the other operational records are often neglected. It is obviously important that all aspects of record-keeping be as effective as time and money will allow.

Record-keeping can be **neglected, superficial, adequate** or **comprehensive.**

5.3.3.5 Counselling and Advice

A number of factors appear to be reasons for farmers' not using available water management methods. Farmers are unwilling to adopt irrigation technology that seems to conflict with practices that they know work on their farms. In other words, if something works, farmers would prefer to stick to it. They therefore need information that is directly applicable and relevant to their farms. Until new technology or management methods have been proven under similar circumstances to his, a farmer will be reluctant to take a risk. Hidden agendas or obscure motives often form part of a technology transfer-exercise, on the part of both the farmer and the promoter of the technology,so the farmer may avoid advice.

It is also natural for a farmer to be wary of technology that he does not understand, and to avoid advice for fear of showing up his weakness. Effective extension requires personal visits, ideally initiated by the farmer. Study groups are worthwhile help but regular dialogue between the farmer and a specialist counsellor, tackling problems together, works best. Ironically, outside intervention is often necessary before a farmer even knows that he has a problem.

Counselling and advice can be **non-existent, avoided, accepted** or **applied.**

5.3.3.6 Training and Experience

Most of the farmers interviewed were well educated, with some form of tertiary education. However, they valued on-farm training, acquired during a period of early tutelage on a family farm, more highly than formal education. Such experience also tended to lead to an early commitment to farming. Other farmers feel insecure because they have missed out on either appropriate tertiary education or experience. Some farmers, however, suggested that more important than training was enthusiasm for farming, and that experience or training in other fields can contribute to success at farming. Although the necessary training and experience can be acquired by various routes, the background of a farmer, and his confidence in it, contributes to his potential for success.

Training and experience can be **insufficient, mediocre, adequate** or **outstanding.**

5.3.3.7 Management Structures

Most farmers are forced to fill a broad range of functions that, in a normal commercial organisation, would be handled by specialists. Although there are large farming enterprises that come close to applying corporate management, with divisions of responsibility and delegated authorities, most farmers have to deal with all the diverse activities on a farm. How he copes with this multiple load will be influenced by the extent to which there is structure in the management approach, even if the farmer has to play more than one role.

Management structures may be **weak, limited, adequate** or **good.**

5.3.3.8 Long-term Planning Activities

In the days of control boards and price stabilisation, it was not necessary for farmers to be capable long-term planners. They merely concentrated on planning for their future acquisition of land, water and finance. Now, though, the chief concern is the identification of profitable marketable crops, in particular, export and contract crops of a quality that will ensure up-market sales. Most farmers do some forward planning, especially in the case of phasing in new permanent crops and, in their decisions to shift to new crops, they are showing a degree of gut feeling for new opportunities. However, the risks are now greater and the farmers are more than ever dependent on a sound information base and well-informed advisors. The farmer's main sources of information have been co-operatives, marketing boards and specialist journals, but a competitive edge has crept into the industry and farmers must begin to plan innovatively. However, despite the urgency caused by the new political dispensation, many farmers have not realised the importance of long-term planning based on good homework.

Long-term planning can be **lacking, conventional, balanced** or **innovative.**

5.3.4 LABOUR MANAGEMENT ASPECT: HELP FUNCTION NOTES

5.3.4.1 Labour: On-farm Organisation

The relationship between many farmers and their workers tends to reflect a complex range of interpersonal obligations. In some cases this relationship is feudal in nature and it is difficult to define in contractual terms. Since we can expect new legislation to demand contracts between a

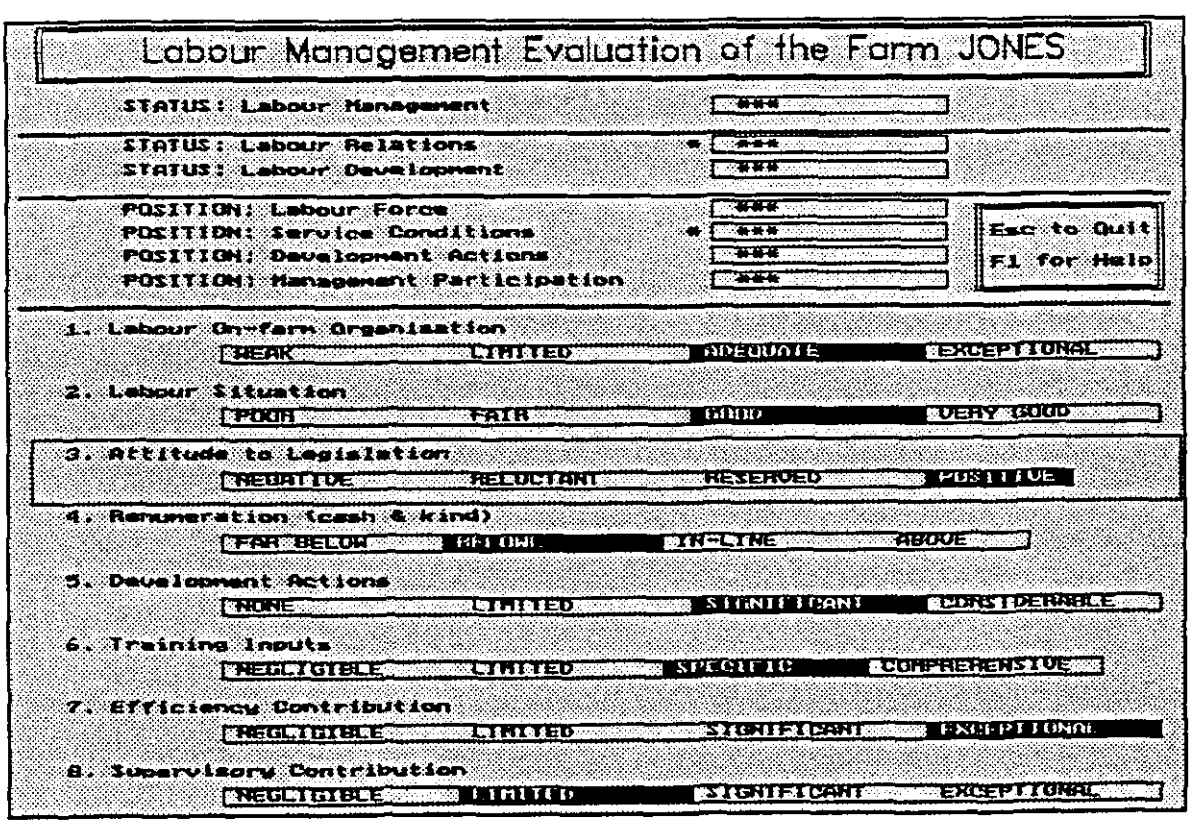

FIGURE 5.5 STATUS: LABOUR MANAGEMENT

farmer and his workers, these feudal relationships cannot continue and should be regarded as a vulnerability. The Rural Foundation has assisted in some areas by restructuring and formalising the relationship between farmers and the farm workforce, by establishing joint committees. In the best cases, farmers have adopted formal personnel management procedures and contractual conditions of service and have thus admirably preempted legislation.

The on-farm labour organisation can be classified as **weak, limited, adequate, or exceptional.**

5.3.4.2 Labour Situation

In general, farmers experience few problems with permanent labour, although they sometimes experience problems in acquiring labour, especially if there are higher paid jobs on offer in the area. Farmers feel that, if enough people are prepared to work for 'affordable' wages and do not cause problems through action such as strikes, the labour situation is good. Most work is manual, and in these cases, the labour organisation is traditional in its paternalism. More training is given to workers who have greater responsibilities, such as tractor and truck drivers and "spanleiers". The number of permanent labourers ranges from four up to 180, which means that farmers are facing a wide range of labour management issues.

Farmers use different criteria to assess their labour situation, and the rating should be based on the farmer's perception of the situation, which can be **poor, fair, good or very good.**

5.3.4.3 Attitude to Legislation

Most farmers say that they do not have grave misgivings about the forthcoming legislation and this generally means that their relationship with labour is within the framework of the new requirements. On the other hand, many practise paternalistic forms of labour management and therefore express fear about some of the demands that may be made by a unionised labour force.

Others express doubts about changing the special type of labour relationships in agriculture. The step from old style feudal relationships to modern labour relations is a big one and some farmers expect problems.

The farmer's attitude to new legislation can be **negative, reluctant, reserved or positive.**

5.3.4.4 Remuneration (Cash & Kind)

The ambiguities in the farmer's perceptions of what a suitable relationship with their workers is, are reflected in their attitudes towards remuneration. Many farmers feel that their workers are living extremely well, since they are provided with all the basic necessities such as food, housing and working clothes. There is sometimes little understanding that the relationship between farmer and labourer is not one of guardian to child. The paternal management style of many farmers is echoed in their attitude towards how and what a farm labourer should be paid. Some farmers pay according to production rate, but this does not seem to be very successful in increasing productivity. Others feel that the demands with regard to basic remuneration placed on them by new legislation are too high.

The remuneration package offered by a farmer can be assessed as being either **far below, below, in-line,** or **above** the levels applicable in the area.

5.3.4.5 Development Actions

Some farmers have introduced new management techniques that allow workers a say in their conditions of employment. Paternalistic and repressive modes of labour management are rejected by these farmers as counter-productive, although they are a minority. New styles of management involve co-operation between workers and farmer to achieve goals for the enterprise that are understood and agreed on, by drawing up formal contracts and facilitating training. This is labour development in the true sense of the word.

Development actions can be **none, limited, significant** or **considerable.**

5.3.4.6 Training Inputs

Farm labour training is provided by Boskop, equipment suppliers, and the Rural Foundation. Unfortunately, training directly related to irrigation has been neglected. Training by the farmer himself is often directed towards specific tasks and does not always provide important broader understanding and skills. On the other hand, training by outside agencies may be too general and theoretical, so that close liaison with the farmer is desirable.

Training inputs can be **negligible, limited, task-orientated** or **comprehensive.**

5.3.4.7 Efficiency Contribution

Competent, trained and motivated staff are an invaluable asset to an irrigation farmer, where detailed supervision is so important, as they can take responsibility for much of the work. Many farmers do not appreciate this fact sufficiently and are careless in their relationships with workers. *This is particularly so in the training and responsibility that they offer workers. Where farmers have* changed this relationship, they have gained an extremely useful workforce.

The efficiency contribution of staff can be **negligible, limited, significant** or **exceptional.**

5.3.4.8 Supervisory Contribution

It is often necessary for an irrigation farmer to fill all the functions that, in a normal commercial *organisation, would be handled by specialist departments. This means that support from his staff* is vital for the success of the farming enterprise. This, though, requires adequate training for lower management. Labourers need to be given greater responsibility so that they can take over the supervision of some areas of the enterprise.

The supervisory contribution of staff can be **negligible, limited, significant** or **exceptional**

5.3.5 Farmer Success Potential Aspect: Help Function Notes

5.3.5.1 Farm Way of Life

One of the key reasons given by farmers for wanting to farm, and for continuing to do so, was the way of life that farming offers. They find farming a challenging career with scope for self-fulfilment and initiative. They consider urban life extremely unattractive and believe that farming can provide for their family's needs, including the education of children. High incomes are not a priority for farmers

Some of the smaller farmers, though, feel trapped by the size of their farms, which cannot support both a retired father and an active son, leading to frustration on all sides.

Many irrigation farmers are finding that the stress imposed by continuing political uncertainty and economic pressures is making farming as a way of life less attractive. The hedge of an appreciating asset is no longer applicable. However, with unemployment rife, the farm still offers a haven.

A farmer's motivation will increase as he changes from finding the farm way of life unattractive, bearable, satisfying or very satisfying.

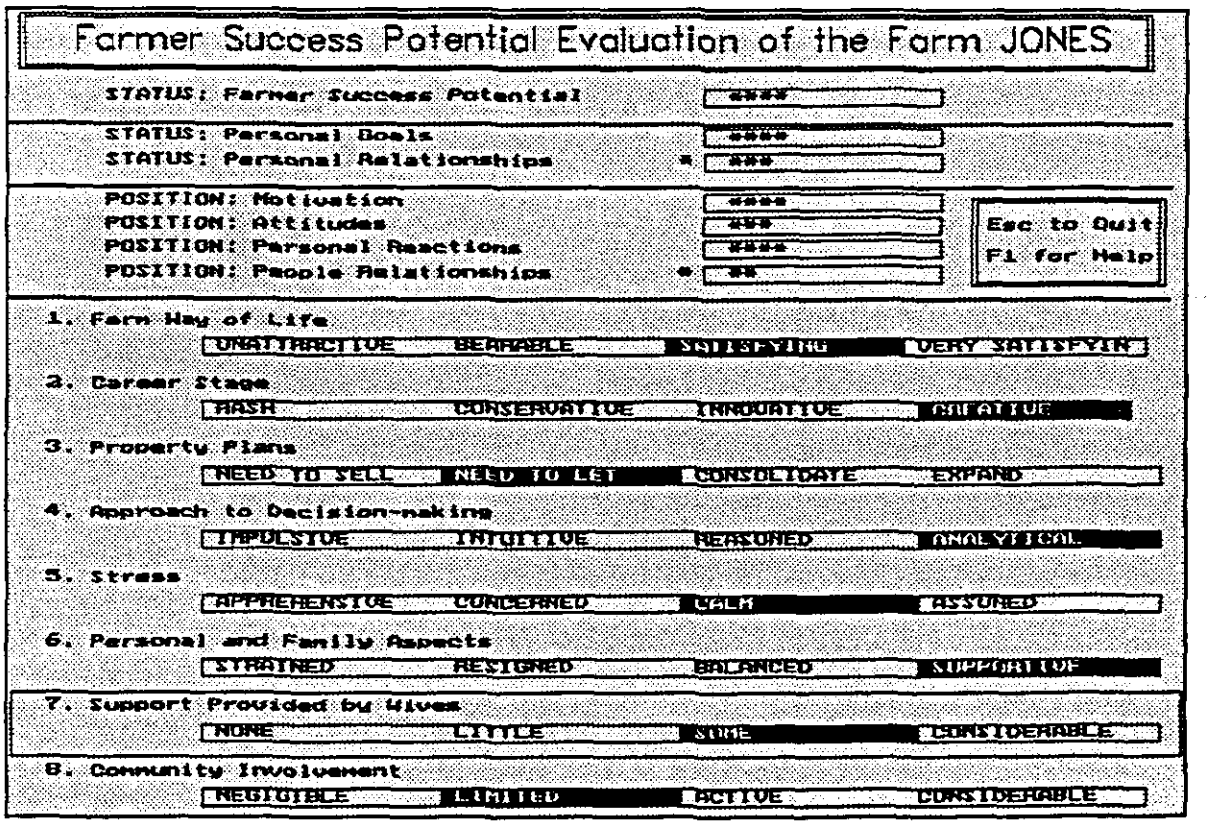

FIGURE 5.6 STATUS: FARMER SUCCESS POTENTIAL

5.3.5.2 Career Stage

It is clear that farmers have different attitudes and different approaches towards farming at different stages in their careers. The older farmer tends to be more conservative, because farming goals have been achieved.

Younger farmers, though, have less to lose and are more innovative. Many an heir has discovered to his cost, however, that innovation must be backed by knowledge and experience. Farmers in mid-career are frequently the most effective, provided they keep up with innovations. We are passing through changing times and farmers must keep pace or go under. The old tried and tested methods are no longer adequate.

A farmer's potential motivation can be related to career stage. At the worst, a farmer is totally inexperienced and rash at the beginning of his career. Slightly better is a highly experienced but uncommitted and conservative farmer at the end of his career. As he gains confidence, the inexperienced farmer will be innovative but, ideally, a farmer is creative, combining experience and innovation.

A farmer's approach can be rated as **rash, conservative, innovative** or **creative.**

5.3.5.3 Property Plans

The majority of farms were bought by the present owner or his family years ago, before the full impact of inflation and high interest rates hit agriculture. Input costs rather than bond repayments are a problem. A pattern of progressive expansion by the successful families, based on own capital, and of stagnation on the marginally viable farms is observed.

The drastic changes in the profitability of field crops have forced many farmers of previously viable farms to consolidate by looking to new, more profitable opportunities, such as high-value permanent crops. Many farmers would sell if they could obtain a reasonable price but it has become harder to sell a farm. Others, though, are planning to expand by purchasing additional property. The farmer's attitude towards the future of the property is a good indicator of his overall position.

A farmer's direction will become more positive as his plans for his property change from a need to **sell** or **let**, to a wish to **consolidate** or to **expand.**

5.3.4.4 *Approach to Decision-making*

Decision-making by farmers is complex and this makes evaluation difficult. A farmer may intuitively make good decisions based on previous experience, gained on his farm under the specific circumstances that applied in the past. However, in times of rapid change, an understanding of the likely changes and of their impact on agriculture and the farm are important. This presupposes good historical records and the ability to plan systematically. (The farmer may also, by temperament, be risk-avoiding, risk-neutral or risk-seeking, and this will influence decisions.)

It can be assumed that times are changing and that a farmer making impulsive emotional decisions and even intuitive decisions will be vulnerable. A farmer who adopts a reasoned approach and

readily takes available information into account will have an advantage. An analytical approach is only possible if the farmer has data at his disposal.

A farmer's approach can be **impulsive, intuitive, reasoned** or **analytical.**

5.3.5.5 Stress

Stress, or its absence, is a valuable indicator of the health of the enterprise. Farmers are under financial pressure due to the changing structure of markets pricing and financing and, although some are calm because they can see the light at the end of the tunnel, many cannot. This has taken the "fun" out of farming and increased management stress. For example, one farmer could be concerned because he had overreached himself through too rapid expansion; and another could be apprehensive about being forced to sell after a bitter period of financial pressure, perhaps from a large bond taken for development purposes.

Irrigation itself can be a source of nagging stress, in particular at certain peak periods when farmers cannot be certain that the system will keep up with demand. A concerned farmer would stay up until 2 a.m. to check his pivots. Anxiety, though, often stems from a lack of real understanding of irrigation principles, and the interactions of soil, water, and crop, and can therefore be averted.

Labour is such a vital factor on an irrigation farm that the impending changes arising from legal, political and social change are a continual source of worry, not unconnected with the security position. Nevertheless, some people are assured of success because they thrive on stress or have foreseen problems and forestalled them.

A farmer could be **apprehensive, concerned, calm** or **assured.**

5.3.5.6 Personal and Family Aspects

A farm is not simply a place of business but is the home of a family and serves, not only their employment needs, but also their leisure needs. This means that decisions made by a farmer do not always benefit the business enterprise but are aimed at improving the family's way of life. Understanding the role of the family is, therefore, important in order to understand the farming enterprise.

Capital appreciation has been an important factor in the RSA because it has catered for the farmer's future and retirement, and left him free to live in the present. Despite a broad distinction in the wealth of farmers, the majority are living well. They are able to provide adequately for family needs, including the education of the children, and to take part in leisure and social activities. They are not subject to the pressures of a family farm in the USA, where, so often, husband and wife have to do everything. It could be, though, that the time is coming in the RSA when production aspects of farm life will have to take priority over the "good life".

The family situation can be **strained, resigned, balanced** or **supportive.**

5.3.5.7 Support Provided by Wives

The farmer, as a manager, needs support for the success of his enterprise. Wives often play a key role in the running of the farm and are particularly involved in keeping records and wage schedules. As a result, it is often the wife who is responsible for the computerisation of the farm records. In some cases, the wife is involved at a basic level in everyday management, for example, through managing the packhouse. Sometimes the wife contributes money through a lucrative farming sideline, such as poultry or bees, but she is seldom in a position to work off the farm. The role of the wife will depend on her other obligations and will, for example, change when the children go to school. Wives certainly play a role in decision-making, though this may be from a subordinate position or indirectly.

A farmer will be able to deal with a much broader range of activities more successfully as his wife and family offer him more support, from **none**, or **little**, to **some** or **considerable**.

5.3.5.8 Community Involvement

Many farmers live within small and close-knit communities. Farmers' associations and study groups significantly influence decision-making on individual farms. They are forums for discussion, not only of common interests, but also of production and management options, and sometimes undertake specialist studies on behalf of their members. They play an important role in organising seminars and workshops and can offer protection against malpractice. The community itself, of course, can ensure that a supplier who has sold faulty equipment to one farmer never gets business in that area again. Some farmers had been leaders in the establishment of Irrigation Boards and their subsequent management. Inevitably these farmers were influential, and well informed on irrigation in general. Some were members of the local soil conservation committees and had helped promote sustainable irrigation farming. There are other groups dealing with a wide range of social and technical matters and, provided the farmer can afford the time, participation is beneficial and should be encouraged.

A farmer will increasingly be at an advantage as his community involvement intensifies from **negligible** to **limited** to **active** to **considerable**.

5.3.6 Financial Situation Aspect: Help Function Notes

5.3.6.1 Accounting Services

Most farmers, or their wives, keep records of purchases, expenditure, sales and receipts, either manually or by computer. The minority still draw up their own books and income tax returns but, today, this is probably unsatisfactory. It is possibly adequate, if an experienced bookkeeper does the final books. Many co-operatives provide a centralised computerised bookkeeping system and, provided the drawing up of accounts is in the hands of a specialist, this can be regarded as a sound approach. There are, however, some farmers who follow a "management accounting" system and this exceptional approach usually requires the services of an economist or accountant.

Accounting functions can be **poor**, **adequate**, **sound** or **exceptional**.

5.3.6.2 Credit Rating

The credit sources used by farmers and their general access to credit are important barometers of the financial position of the farm but money is always a sensitive and often private issue. In general, though, few farmers make use of Landbank facilities or Agricultural Credit schemes. Co-operatives and commercial banks appear to be more popular and quite adequate sources of credit for production loans.

The sources of credit available to farmers are indicative of their financial position. Obviously, a farmer dependent on an emergency debt consolidation programme will be in a more precarious position than one who has had no problems in negotiating a commercial bank loan.

The farmer's credit rating can be classified as **unsatisfactory, reasonable, good or very good.**

5.3.6.3 Access to Income

Farmers are generally on the look-out for sources of additional income, apart from on-farm activities, to help finance special developments, or to stabilise the main-line enterprises. Interestingly enough, though, few farmers have a significant source of off-farm income. They find farming too time- and energy-consuming to permit substantial outside interests. In the earlier stages of their careers, a young wife's salary is an asset but, once children arrive, she is no longer able to work off the farm.

A farmer's access to income can be ***inadequate, restricted, adequate or unlimited.***

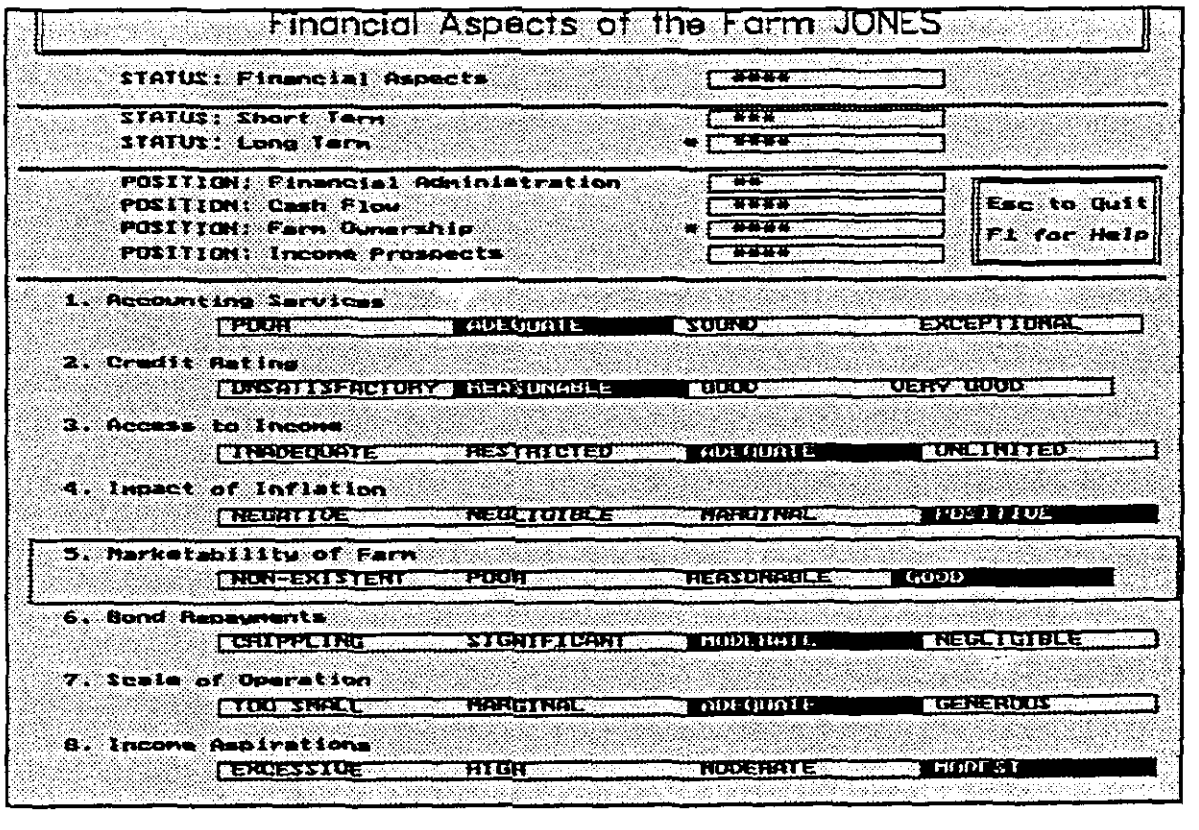

FIGURE 5.7 STATUS: FINANCIAL ASPECTS

5.3.6.4 Impact of Inflation

Inflation and capital appreciation have made farming possible for many farmers. Capital appreciation, in particular, ensures relative wealth, even if profits are negligible. Farmers who do not carry large bonds with high interest rates are still at an advantage. Inflation, though, is no longer making farmers rich. Farmers are now facing difficulties because of significant increases in input costs, especially equipment costs, in relation to product prices. Inflation is, therefore, negatively influencing some farmers, particularly those who market their products locally.

The impact of inflation on a farmer can, therefore, range from being **negative**, to being **negligible** or **marginal**, to being **positive**.

5.3.6.5 Marketability of Farm

A ready market for farms ensured that capital appreciation contributed to the viability of irrigation farming but, recently, the market for farms has declined, particularly where field crops with low profit margins are produced or where there are water shortages. Nevertheless, new developments and high-value export crops keep the value of some farms up. Renting costs of farms are a good indication of their market value.

The marketability of a farm can be categorised as **non-existent**, **poor**, **reasonable** or **good**.

5.3.6.6 Bond Repayments

High interest rates make it less viable to buy a farm with borrowed capital. Most successful farmers inherited their farms or bought before interest rates became prohibitive. Farming, though, is not a static profession and most farmers acquire additional land over the years, sometimes financed by bonds. The pattern, however, is to try and utilise own funds and to limit long-term debt as much as possible.

Bond repayments can be **crippling**, **significant**, **moderate** or **negligible**.

5.3.6.7 Scale of Operation

In order to assess an existing scheme or the viability of establishing a new one, the practice is to compare it with the minimum size of irrigation farm that can be regarded as an economic unit in that area. The method is complex and assessment cannot be done in the course of an open-ended interview. Rating has to be based on the general situation in the region. For example, has a farmer rented or bought additional land, how intensive is his development of the land, and what is the gross profit or turnover of the farm?

The farm size relative to that of an "economic" unit can be **too small**, **marginal**, **adequate** or **generous**.

5.3.6.8 Income Aspirations

The objectives of most irrigation farmers fall into five broad categories (Backeberg, 1987). They want to be able :

- to meet normal family household demands;
- to provide continuity so that the heir can farm;
- to practise a preferred type of farming;
- to accumulate capital through buying new lands; and
- to provide for a special objective such as a model farm.

Income aspirations can be either **excessive, high, moderate** or **modest** in relation to the potential of the farm.

CHAPTER 6

APPLYING SAPFACT TO SPECIFIC IRRIGATION AREAS

6.1 INTRODUCTION

An attempt was made to develop profiles of the farmers interviewed, using SAPFACT ratings, supported by descriptive notes, to include in this report. It was not possible, however, to do this in a meaningful way without disclosing the identity of the farmer. As indicated earlier, the interview findings were not discussed with the farmers and, as some of the comments are negative, unauthorised publication could have undesirable consequences. It was decided to compromise by compiling general reviews of irrigation areas based on the 48 factors identified in SAPFACT 1.0, and to support these with the tabulated SAPFACT ratings for indivdual farmers (Chapters 7 - 9). In this way, an overall picture is provided of the factors that have a particular influence on irrigation farming in the area, and of the relative status of each farmer, without disclosure of identity.

The general reviews at the beginning of Chapters 7 - 9 are useful in that they identify area differences. These can be physical, economic, technical or cultural. The qualitative SAPFACT ratings at the end of the chapters are useful in that they identify the relative strengths and weaknesses of individual farms and farmers.

In a practical situation, it is envisaged that an open-ended interview would be documented with the assistance of SAPFACT and would include notes providing additional information and comments. These should be discussed with the farmer as a natural follow-up to the initial interview.

This process would enable the technical person doing the interviews and the farmer to assess the situation together. The analysis can identify key opportunities and restraints and promote viable action plans. There is little point in stressing irrigation scheduling if water supply is irregular or equipment is poorly maintained or operated. Both advisor and farmer should feel happy that any proposed action is achievable within the limits imposed by natural resources, finance and farmer likes and dislikes.

To illustrate the approach, general reviews and specific SAPFACT ratings have been developed for three areas:

Orange River irrigation area below the PK le Roux dam (Chapter 7)
Natal coastal areas (Chapter 8)
General irrigation areas in the Transvaal (Chapter 9)

The general reviews, and the SAPFACT 1.0 ratings, have been developed for the information requirements of anybody involved in irrigation, including an irrigation engineer, equipment supplier, irrigation extensionist, scheduling specialist, irrigation scheme planner or irrigation counsellor. The interests and activities of the person conducting the study will influence the approach adopted but SAPFACT can be edited to conform to individual requirements.

6.2 MAJOR INFLUENCES

As an introduction, it is interesting to review some of the major influences that determine the character of irrigation farming in each of the areas.

6.2.1 *Irrigation Water Supply*

Irrigation water supply has an over-riding impact on the irrigation in an area. Irrigation farming is characterised by high investment, costly inputs and the risks imposed by disease, pests, heat waves, frost, wind and market gluts. However, the problems of having insufficient water dominates farmer thinking.

The construction of the major dams in the 1960's stabilised the irrigation water supply along the Orange river. **The schemes developed below the PK le Roux dam were "modern" in concept and farmers were provided with water under pressure, which they could tap at will,** provided they did not exceed their annual quota, so eliminating a major restraint. The riparian owners were nearly as well off, although they had to pump the water from the river. This surety of supply made it possible for farmers to achieve high yields, despite the hostile climate and light, crusting soils. However, subsequent to the survey, the extreme drought conditions resulted in quotas being reduced for a season.

Transvaal farmers are haunted by the spectre of water shortages. There is competition from industry and rapidly expanding residential areas, and the Hartebeestpoort and Loskop dams are subject to pollution. It is difficult for farmers to plan and manage when they never know from one season to the next if they will have adequate water supplies. In addition, these areas were originally planned for flood irrigation so that water is at best supplied weekly, on order, and farmers using modern methods must provide their own on-farm water storage to even out supply.

The rivers along the eastern seaboard account for a very high proportion of the country's run-off but the bulk is in summer storm flows and there are periodic droughts of great severity. **The Irrigation Boards along the Natal coast seem now to have achieved reasonable water security by constructing dams in the rivers.** Thus, although there are some areas where drought has a drastic impact on irrigation, normally, Natal cane farmers can expect to "keep going".

Farmers in all areas have made major investments in "on-farm" irrigation and, directly and indirectly, the state has made a massive contribution by providing infra-structure.

6.2.2 Labour

In the developed irrigation areas of the world, "one-man operations" tend to be the order of the day, except for seasonal activities such as harvesting. Many of the irrigation systems, such as pivots and computer-controlled drip, have been developed with this in mind. **Irrigation farms in the RSA tend, however, to remain labour-intensive.** When one considers the number of permanent labourers on irrigation farms and the impact of legislation and trade union activities on wages, **one wonders how much longer this approach will be affordable.** Labourers will have to be developed into

operators capable of undertaking the technical and organisational tasks on an irrigation farm and this will impact on all aspects of irrigation management.

Along the Orange river, where pivot irrigation dominates, the permanent labour force varied from 3 to 12, on 120- to 200-hectare farms, with the more efficient farmers employing the fewest people, indicating that the process of evolution had progressed significantly. The position on the mixed cane farms in Natal was very different, which is understandable because cane is labour-intensive and cutting extends over a long period. The least number of labourers on a farm was 50 (100 hectares) and the most 180 (380 hectares). The best ratio was 80 labourers working on 240 hectares.

The position in the Transvaal was not very different! Farms with about 120 hectares under irrigation employed in the order of 30 people, half permanent. A 200-hectare operation producing seed employed 100 permanent people and 50 seasonally, while a similar sized farm with field crops only had a complement of 70.

6.2.3 Irrigation Management and Scheduling

As has been stressed, irrigation farmers do not accord the highest priority to irrigation and water management, and this is true internationally. Irrigation is a necessary chore, not an end in itself. There are farmers, however, who do manage their irrigation according to scientific principles.

The farmers along the Orange River are subjected to extreme conditions. In a drought year, atmospheric demand can be very high. At peak periods, a maize or wheat crop may require up to 12 mm of water per day through the irrigation system. Unfortunately, the only practicable irrigation system in the deep but undulating sandy soils is the centre pivot, which has a high rate of application at the outer towers. Run-off resulting from slopes and surface crusting can limit individual applications to 12 mm per day so that a situation arises where daily 12 mm applications are the only solution. There are lands where heavier applications are possible and, even at peak periods, cycles can be extended to two or three days.

This is a far cry from conventional flood or sprinkle irrigation in areas with a more reasonable atmospheric demand, where applications in excess of 50 mm of water are normal but individual applications are spaced one, two or three weeks apart. There is no room for error in the situation along the Orange River and it is the farmer who understands the basic principles of irrigation who has both peace of mind and high yields. It was in this area, and for this area that the computer program BEWAB, (Bennie *et al*, 1988) which exploits the creation of deep soil water reserves and pre-programmes irrigation applications throughout the season, was developed. BEWAB, especially if cross-checked by reference to A-pan or automatic weather station evaporation data, has proved more than adequate. Mechanical breakdowns cannot be tolerated.

Cane irrigation along the Natal coast is very different. Dragline sprinkler systems applying 42 mm every 14 days could be considered typical. In hot dry periods, this is not adequate but the main function of the irrigation is to "top-up" the water content of the soil and cane is a tolerant crop. The urgency and anxiety of the Orange river farmers are conspicuous by their absence.

Understandably, little attention is given to scheduling aids, although all the know-how is available. Where the farmers grow citrus using micro systems, the picture changes but, even then, few farmers use scheduling aids such as tensiometers.

Atmospheric demand is moderate over the Transvaal and most of the area receives reasonable summer rains so there is not excessive pressure on irrigation scheduling. Tensiometers are used by the more aware farmers and some still make limited use of the A-pan. The application of BEWAB-type programmes is still in its infancy. The main problem is the critical shortage of irrigation water and the difficulty of achieving the appropriate distribution during the winter growing season. A greater problem is deciding how much of the precious water quota can be allocated to augment rain during the summer season. Water management is of economic importance to irrigation farmers but the relatively bland conditions tend to disguise this.

CHAPTER 7

ORANGE RIVER IRRIGATION AREA BELOW PK LE ROUX DAM

7.1 GENERAL

The first farms to be developed on the Ramah irrigation scheme on the right bank of the Orange river were occupied in 1977 and the scheduled area is now approximately 4 000 hectares. This area is of particular interest because water is available on demand and under pressure and, at the time of the interviews, no cut-backs in water quotas had ever been necessary. The development along the left bank is private, and started at about the same time. The scheduled area on the left bank is nearly 11 000 hectares and extends to Hopetown. Irrigators on the left bank pump water directly from the river. Irrigation is almost entirely by means of centre pivots.

The water supply position is very favourable, but this is partially negated by an uneven topography and light soils that crust easilly. The climate is extreme, with unexpected heat-waves and cold spells aggravated by high winds. The main crops have been cotton, maize and wheat but cold damage and low prices have virtually eliminated cotton. Early maize yields up to 14 tons per hectare are achieved but late maize yields are in the order of 8 tons and wheat yields 6 tons. Production is confined to the field crops and is totally dependent on irrigation, although provision should be made for the effective utilisation of the annual rainfall of 300 to 400 mm.

This is a relatively young irrigation area and farms have not been passed down from father to son, as is so often the case in the Western Cape and on the Natal Coast. The bulk of the farmers interviewed were amongst the most effective in the area and had weathered a difficult period which had, apparently, eliminated many with financial or managerial vulnerabilities. They appeared to be in a reasonable financial position, although there was a preoccupation with the need to increase production to compensate for rising costs.

The farmers could be divided into two categories, viz. those that understand irrigation, and those that don't. The farmers interviewed were mostly in the first category but even they differed widely in their methods. Some preferred an intuitive approach and others a more scientific instrumented procedure. All understood the soils and crops and managed the pivots to obtain the longest irrigation cycles possible under their conditions. They had learned to cope with crusting and compaction and, where necessary, had had the pivots modified and updated to meet requirements. There was an absence of confusion and anxiety at peak season and irrigation water was used to best advantage with little waste.

The farmers that did not really understand irrigation were, from all accounts, representative of 80 % of the farmers in the area. They feared "falling behind" at peak season. Some irrigated until they could see the water running out of the land. This lack of understanding of irrigation did not necessarily make them unsuccessful farmers, but is a vulnerability.

7.2 IRRIGATION MANAGEMENT ASPECT, ORANGE RIVER IRRIGATION AREA

The light soils and broken topography preclude flood irrigation and for all practical purposes there has been standardisation on centre pivot systems. The dry, windy conditions with little rain and cloud cover in the summer period result in possibly the highest atmospheric demand experienced anywhere in the RSA. To compound the problem, soil crusting and sloping lands result in excessive run-off and, in many cases, no more than 12 mm of water can be applied at a pass, just sufficient to cater for the daily atmospheric demand at peak. The uninterrupted supply of irrigation water to the soil profile is of paramount importance so, although irrigation water is available on demand, there is little room for error in delivery to the soil. (Cf. the general situation for this aspect, described in paragraphs 5.3.2.1 - 8).

7.2.1 Equipment Operation and Maintenance: The importance of equipment reliability is well appreciated in this area and mechanical equipment is not taken for granted. Major breakdowns are serious, because the nearest service point is Bloemfontein. Farmers emphasise the importance of close personal supervision and of being available to cope with breakdowns. One farmer confessed to carrying out equipment checks until the early hours of the morning during peak periods. While mechanical reliability is a priority, possible functional performance deterioration over time received little attention.

7.2.2 Equipment Design and Installation: Farmers and their suppliers have been on a learning curve since 1978 and satisfactory design procedures and equipment specifications have been established. This is a difficult area where "standardised" solutions are seldom satisfactory. The pressure from the canal is adequate for low pressure pivots but, on sloping or crusting lands, it has been found necessary to install high-pressure units, and to reduce the radius and area irrigated. Typically, a farmer has had his pivots modified from 10 mm per day low pressure to 12 mm high pressure units and completes a circle each day in the peak season. Another, with flatter lands and more favourable soils, utilises low pressure and aims at 30 mm applications and a four-day cycle. Some of the farmers have installed 180° pivots in order to improve management. The correct selection and design of equipment is important and can have management and cost implications.

7.2.3 Annual Water Supply: The supply of irrigation water was always regarded as being assured but, after the survey, water restrictions were imposed for the first time. All in all, however, the water supply can be considered very satisfactory. The 1200 mm annual allocation, with the option to purchase an additional 400 mm, is adequate for 150 % land occupancy but could be marginal if this moves up to 200 %.

7.2.4 Water Delivery: Water is available "on demand" from the canal and can be pumped from the river at any time. The vulnerabilities lie in power failures and cuts or mechanical breakdowns.

7.2.5 Understanding of Irrigation: Difficult soils and exceptionally high atmospheric demand place a premium on farmers' having a thorough understanding of irrigation principles. It is really only those farmers who were directly associated with on-farm research projects that have this understanding. The dangers associated with "keeping up" at critical times can be obviated by

utilising the very considerable water reserves that can be built up in the soil profile and by applying judicious deficit irrigation techniques. Unfortunately, it appears that it is not possible to transmit this knowledge by conventional extension techniques and that individual counselling is required.

7.2.6 Attitude to Water Management: There are irrigation farmers who regard irrigation as a necessary evil and accord water management a low priority. The farmers in this area are aware of the importance of water and irrigation management. It was noticeable that farmers who had a good understanding of the subject were very successful in improving water use efficiency.

7.2.7 Irrigation Methods: There is a limited choice available to the farmers in the area. Correctly designed and managed centre pivots have proved effective. In the earlier days of the scheme conventional sprinkler systems were used, and there are a limited number of travelling irrigators still operational. There is one linear-move unit operating and this has proved to have distinct advantages over pivots in that the high application intensities experienced on the circumference of the pivot circle are obviated. Unfortunately, linear moves are expensive and more difficult to operate. In future years there may be suitable drip systems to augment the pivots.

7.2.8 Scheduling Practices: Some of the farmers who had been exposed to the on-farm research based their irrigation management on BEWAB (Bennie, 1988) supplementing the program with their own experience. Others had developed approaches specifically suited to their circumstances and management styles. A farmer who consistently achieves exceptional yields admits that he has always adopted an "intuitive" approach to irrigation. His only instrument is an auger, used with considerable understanding of the basic principles of irrigation. Bennie reports that BEWAB was developed after a careful analysis of the approaches followed by knowledgeable farmers, and it is certainly applied very effectively in the area. Few farmers make use of conventional A-pan or tensiometer procedures.

Unfortunately the majority of farmers just apply water, anxious about keeping up with crop requirements and fearing breakdowns, and so over-irrigate. The main restraining factor is excessive power costs. However, there was a scheduling advisor operating in the area who measured soil water from time to time, and was able to show farmers that they were over-irrigating.

7.3 CROP PROFIT POTENTIAL ASPECT, ORANGE RIVER IRRIGATION AREA

This area is interesting in that, while it appears, at this stage, to be unsuitable for high value permanent crops, traditional field crops such as maize and wheat can still be profitably produced. They are preferred to sweetcorn, popcorn, potatoes, soyas, beans, groundnuts, peas and cotton, which have all featured in the area at one time or another. There is, however, pressure for increased production and turnover and there is debate as to how this can be achieved without excessive risk. (Cf the general situation for this aspect, described in paragraphs 5.5.1.1 - 8).

7.3.1 Suitability of Climate: High yields of field crops are possible. Farmers reported early maize yields of 14 tons per hectare, 12 tons for late maize, 7 tons for wheat and over 4 tons for

groundnuts. The climate is fickle, however, just too cool for consistent production of cotton, which yields up to 5 tons in adjoining areas with higher night temperatures. Untimely rain or cold cause problems with wheat and other crops. The high atmospheric evaporative demand, especially in drought years, can lead to severe stress. The climate is evidently not suited to available cultivars of permanent crops.

7.3.2 Suitability of Soils: The soils are generally light and the most suitable areas were selected when the irrigation scheme was laid out on the right bank of the river. There are, however, wide variations in the soils, particularly in respect of crusting, slope and effective depth, which can make all the difference to the viability of the farming enterprise. There are level lands with soils well over two meters deep where, with the right management, top yields are obtained.

There are areas on the left bank with good soils but there are also areas where the position is unsatisfactory with difficult soils and broken topography.

7.3.3 Crop Possibilities: The outlook for alternative crops is limited. Cotton was a big disapointment, even in the days when prices were reasonable. Groundnuts may become viable with the introduction of disease resistant varieties but potatoes cannot be planted more than once on the same land, and both rely heavily on seasonal labour. Crops such as popcorn, peas and soya are possibilities but are unfamiliar to most farmers. Few farmers were venturing into the "new" crops because it takes time to get to know them and, in almost all cases, they make considerable inroads into management resources.

The trend is towards 200 % land occupancy, concentrating on wheat and maize. There are now wheat varieties that can be planted as late as August, while early maize varieties are being planted late and fertilised for high yields. In assessing a farmer, his success with alternative crops or rotations is an important element.

7.3.4 Crop Yields: Yield per hectare is of paramount importance in the case of high-input intensive production of field crops under irrigation. The yields obtained by top farmers in this area are possibly the highest achieved anywhere in the RSA, recorded yields have been discussed in previous paragraphs. Not all farmers approach these levels and the actual yields achieved are a good indication of the status of the farm.

7.3.5 Production Costs: No out-of-the-ordinary cost factors were identified. None of the farmers interviewed were adopting a "minimum input" approach or investing heavily in an attempt to improve production. Some farmers burned their fingers by purchasing expensive cotton mechanisation equipment, while attempts at achieving 200 % land occupancy put heavy demands on existing machinery pools.

7.3.6 Gross Margin Potential: The cropping pattern is a limitation and if the present pattern of producing annual field crops continues attention will have to be given to more efficient production. This implies yield improvements while limiting expenditure on inputs. Gross turnover may be increased by higher land occupancy percentages but this has inherent risks.

7.3.7 Market / Price Risk: Absolute market risk is largely obviated by concentration on the staple grains. The changes towards a more open market approach will have a still imperfectly identified impact in the future. The present policy, which relates grain prices to domestic production levels, means that irrigation farmers welcome drought in the main grain producing areas!

7.3.8 Production Risk: The main sources of risk identified by farmers are climatic variations, particularly unseasonal cold and rain, diseases and mechanical breakdowns during peak irrigation demand periods. The move to 200% land occupancy is regarded as being potentially dangerous from the point of view of disease. Crop rotation, including fallow, seems to play an important part in determining the incidence of diseases and any deviation from established and well tried practice has to be approached with caution. The proof of the pudding lies in the eating, however, and there are farmers who have broken the rules successfully. Possibly they are exceptionally good managers?

7.4 GENERAL MANAGEMENT ASPECT, ORANGE RIVER IRRIGATION AREA

It was interesting to note the portfolios of skills and preferences that went to make up management styles. Possibly the most effective was rationalisation of production on familiar crops, coupled to dedicated personal supervision and a good understanding of irrigation. This approach appeared to be effective on irrigated areas up to 120 hectares. The permanent labour force could be kept small, and planning and record keeping limited to the essentials. There are obvious limitations: the farmer has little or no management support, both the size and complexity of the enterprise must have limits, and it is doubted if sufficient attention is given to the wider issues of business management and innovative planning.

There were farmers who concentrated on record keeping and planning at the expense of personal supervision, but this was more than balanced by an effective labour force. This would seem to be sound, if the farmer's gifts lie in administration rather than field activities. The role of a counsellor would be influenced by the level and style of general management. If management as a whole is below standard, an attempt to upgrade irrigation in isolation would be counter-productive and it is important to identify target individuals for counselling. (Cf the general situation for this aspect, described in paragraphs 5.5.2.1 - 8).

7.4.1 Supervisory Support: On farms with two or three pivots, the farmer normally carried the full supervisory load personally. This is perfectly feasible but the farmer is tied down which could have an adverse influence on overall management effectiveness. A good irrigation farmer must be prepared to be at it all the time. One farmer relied on his permanent labourers to run the daily farm activities, and others had a varying degree of support from long-time employees. It was noticeable that, on a farm where there were sons assisting the farmer, there was a willingness to experiment with "new" crops. This could have been because there was supervisory support.

7.4.2 Personal Supervision: The interviews confirmed that the efficiency of operations on these compact specialised farms was largely determined by the personal competence of the farmer. This was particularly true when he undertook the personal supervision of field operations. Competence implied an energetic approach, dedication, attention to detail, mechanical aptitude and a thorough understanding of farming operations.

7.4.3 **Seasonal Planning:** Seasonal planning is largely concerned with trying to read the market and the weather, in order to decide on the crop mix and how much to plant. There were farmers who accepted routine cropping patterns and others that followed a neighbour's lead. The circumstances in the area limit the options open to the farmers. The general view was that, once the major decisions had been made, it pays to be as flexible as possible in the short term.

7.4.4 **Record Keeping:** Record keeping goes hand in hand with seasonal planning, a good data base is an essential planning aid. While financial record keeping was good, less attention was given to other aspects. This could be because the farming pattern is relatively standardised. Few farmers were able to say how much water they had applied to specific crops, or in a season in total but *there were exceptions, where computerised or manual records were kept in detail.*

7.4.5 **Counselling and Advice:** The farmers that were associated with on-farm research have maintained contact with the researchers and seek specialist advice from time to time. In general, however, it appeared that farmers turned to the suppliers of irrigation equipment and farming requisites for technical advice. There was a technical specialist with one of the farming requisite companies that provided much-appreciated irrigation counselling to several farmers as an additional service. This was discontinued because the farmers became dependent on the guidance, regarding it as a right, and reacted negatively if the counsellor was unable to fit in regular visits.

7.4.6 **Training and Experience:** The farmers interviewed probably fell in the top 20 % category, and it is not known how representative they were of the farmers as a whole. They had, with one exception, come into the area from elsewhere and had had to familiarise themselves with farming under the special circumstances experienced along the river. They were generally well qualified: of those who had learned their farming in the area, three had agricultural diplomas and there was an engineer and an economist. One of the farmers had been a stock farmer in the area for many years and had added irrigation when water became available; one had been a dry land crop farmer; *and the last had experience of flood irrigation on another scheme, plus business experience.*

7.4.7 **Management Structures:** A farmer is expected to fulfil all the management functions associated with running a business enterprise and this can be an impossible task; if the farm is large and includes several enterprises. The farmer requires some formal or informal support structures. The irrigation farms visited were compact and specialised and managed by individuals, so that management structures did not come up in the discussions.

7.4.8 **Long-term Planning:** While some of the farmers were giving considerable thought to ways and means of increasing production, the nature of the farming does not necessitate the development of long-term strategic plans. Only the availability of new cultivars, or drastic changes in the market situation, would stimulate thinking about future development.

7.5 LABOUR MANAGEMENT ASPECT, ORANGE RIVER IRRIGATION AREA

The farmers interviewed employed from three to ten permanent labourers, who lived on the farm. Farmers who concentrated on grains that were harvested and transported by contracters made limited use of seasonal labour but those that produced groundnuts, potatoes or cotton recruited labour when required. The approach to labour management differed considerably from that experienced in the more labour intensive irrigation areas, and there were few problems. (Cf the general situation for this aspect, described in paragraphs 5.5.3.1 - 8).

7.5.1 Labour Organisation: The relatively small labour forces and the close personal contact with the farmer meant that there was little pressure to set up workers committees or formal contracts, although one or two of the farmers had made moves in that direction.

7.5.2 Labour Situation: The labour situation was generally satisfactory, although one farmer complained bitterly about the untrustworthiness of his permanent employees while another was equally unhappy about seasonal labour!

7.5.3 Attitude to Legislation: The farmers accepted that labour legislation was needed and inevitable but had misgivings about possible uneconomic wage levels.

7.5.4 Remuneration: Remuneration seemed to be generally in-line with accepted practice, as is to be expected in a relatively isolated rural community with little opportunity for alternative employment.

7.5.5 Development Actions: The impression gained was that relationships with labour were good but that the movement towards development, pioneered by the Rural Foundation and further developed in some communities had not yet reached the area.

7.5.6 Training Inputs: Employees received on-the-job training from the farmer and their fellow workers. Limited use had been made of Boskop training facilities for specialised purposes.

7.5.7 Efficiency Contribution: Labour, by working with the farmer and utilising the skills built up over time, had undoubtedly made a significant contribution to efficiency. On one farm, the operation of the pivots, including fertigation and all maintenance and operation, had been totally delegated to selected employees. It was not clear what training they had received, or how successfully they had met the challenge. Another farmer had left his employees in charge for some days over Christmas but they were unfortunate enough to have to deal with an exceptionally hot spell that required extraordinary action. Serious crop damage resulted. The farmer accepted full responsibility.

7.5.8 Supervisory Contribution: The farmers themselves were largely responsible for supervision and the permanent employees did not appear to make a big contribution except, in helping organise and control seasonal labour.

7.6 FARMER SUCCESS POTENTIAL ASPECT, ORANGE RIVER IRRIGATION AREA

An assessment of the farmer and his "success potential" is subjective, and possibly presumptuous but, for a potential counsellor, it is valuable exercise. The farmers enjoyed farming and were not as depressed by drought and economic circumstances as some other irrigation farmers. Most were in a "mid-life" phase of consolidation which was not neccessarily related to their age.
There were farmers that admitted that coping with heat-waves and the breakdown of irrigation equipment was stressful. Several farmers received direct support from their wives in the running of the farm, particularly record keeping, but no wives were directly involved in irrigation management. (Cf the general situation for this aspect, described in paragraphs 5.5.4.1-8).

7.6.1 Farm Way of Life: All the farmers interviewed were positive about farming and appreciated the independence and the challenge. None had enjoyed the drought period, and the hot demanding conditions, but they were proud of their achievements.

7.6.2 Career Stage: There was a relatively young man starting out on his career with heavy financial commitments and a well-to-do elderly farmer approaching retirement and setting up a well founded trust fund for his heirs. Most of the farmers interviewed, however, were in mid-career, in that they were well established and were not considering pulling out of farming or embarking on major expansion. The mood was one of cautious innovation, with a preference for developing the familiar rather than the unfamiliar. The farmers were sufficiently knowledgeable and experienced to be able to manage their farms with confidence. This does not imply that the confidence was always well founded!

7.6.3 Property Plans: As far as could be ascertained, none of the farmers were planning to sell or let their properties which was indicative of their being in a reasonable position. Two were considering withdrawing from rented properties in order to consolidate their financial position, while two of the younger, but well established farmers, had recently extended their properties by purchasing an additional plot.

7.6.4 Decision-Making: Inevitably, the approach to decision-making varied with personality and ranged from intuitive to carefully reasoned, typical of the entrepreneurial role that the farmer is forced to play. It is not always the carefully reasoned decision that turns out to be the "right" one but it was clear that the top farmers based their decisions, not only on a sound knowledge of the facts, but also on a realistic appreciation of their own capabilities.

7.6.5 Stress: Managing an intensive irrigation farm in this inherently hostile enviroment is not a relaxing occupation. With the exception of weather vagaries irrigation is probably one of the main factors contributing to stress. It is a day-in and day-out chore demanding attention to detail and

difficult crisis management. It was noticeable that farmers with an above-average understanding of the principles of irrigation seemed to be more relaxed and in command of the situation than their less well informed neighbours.

7.6.6 Personal / Family Aspects: This is obviously a link in the chain that can contribute to success or failure but it can only be assessed in the context of the individual.

7.6.7 Support Given by Wife: Quite apart from the contribution that a wife makes to the family, she can contribute to the running and management of the farm. It appears that, the more complex the portfolio of enterprises, the more opportunity there is for wives to make a meaningful contribution. In this area, the farming enterprises are limited to irrigation under two or three pivots, and sheep production on grazing. There were wives that helped with record keeping, and all were well informed on farming matters, but they do not have a managerial role. The position was typified by one farmer and his wife. "His wife doesn't keep the books, she just keeps an eye on them" and "...he may make the decisions but I see to it that he doesn't do 'mal dinge'".

7.6.8 Community Involvement: The impression gained was that there were the normal community activities in the area and that the co-op was an important institution but that committees and study groups did not play as important a part as is the case in some irrigation areas. The farmers were involved in community activities, although one farmer did comment that he didn't seek or take advice from anybody.

7.7 FINANCIAL ASPECTS, ORANGE RIVER IRRIGATION AREA

All but two of the farmers were in the favourable position that they had acquired their original properties at low cost and had been able to finance expansion out of income when this was still feasible. There may have been a tendency to over-capitalise on irrigation equipment and tractors but these debts had been cleared. As a consequence, the scale of operations and turnover was satisfactory and long-term debt was low.

No attempt was made to obtain details of the financial position of individuals and it is not known if the same situation applies to the run-of-the-mill farmers. The impression gained, however, was that, while they could not afford crop failures, and were vulnerable because they were dependent on low return field crops, the financial position of most of the farmers was reasonable. There was an absence of large estates and income aspirations were relatively modest. The most vulnerable farmers are those that pump water from the river, especially if the farms have a broken topography with sloping lands and variable soils. **(Cf the general situation for this aspect, described in paragraphs 5.5.5.1 - 8).**

7.7.1 Accounting Services: The farmers kept their financial records either manually or on computer, while the co-op offered a computerised service. It can be assumed that they all have professional help with drawing up final accounts and income tax returns. It is not known whether any systems directed at management accounting are in use or if farmers are advised on management aspects.

7.7.2 **Credit Sources:** No details were obtained, but the general impression was that farmers relied on normal commercial credit sources and that Land Bank and state credit schemes were not extensively utilised. The original "settlers" on the irrigation scheme were in a favourable position, in that they had paid a low price for the land and had received very generous terms for financing generally. Credit did not seem to be an issue.

7.7.3 **Access to Income:** *During the interviews, an attempt was made to judge if the gross income* of the operation was adequate to provide freedom of action, and a cushion against crop disappointments or unexpected expenditures. Normally, the grain crops can only be expected to yield a modest gross return per hectare, unless drought depressed production results in inflated prices. *In order to increas income the farmer is limited to higher unit yields, more intensive land* occupancy under the pivots, physical expansion by purchase or renting of additional lands with water rights or a more profitable crop (difficult to identify). Few farmers seemed to have access to off-farm income; there is not much scope for other employment.

7.7.4 **Impact of Inflation:** The extent to which the farmers had benefited from inflation was largely a matter as to when they had commenced irrigation operations in the area. Early "settlers" had a big advantage and those who came later were progressively less well placed. While most of the farmers interviewed had been favoured by inflation, there was some doubt as to how long this would continue to be the case.

7.7.5 **Marketability of Farm:** Much of the wealth derived from irrigation farming is associated with capital appreciation, but this assumes that the farm can be sold at a reasonable price. At the time of the survey, there were areas in the RSA where it was virtually impossible to sell an irrigation farm and wealth had evaporated. This was not the impression gained in this area. The farmers' estimates of farm values may, or may not, have been optimistic but farms could be sold or let.

7.7.6 **Bond Repayments:** As discussed in paragraph 6.2.7.5 most of the farmers interviewed had redeemed their bonds, only two who had acquired farms recently still had significant bonds.

7.7.7 **Scale of Operation:** At one time, "economic farm size" was a key factor assessed when evaluating a proposed new irrigation development. Scale of operation is a similar concept. It appeared that farms with two pivots catering for from 100 to 120 hectares were of adequate scale for the circumstances in the area. All but two of the farmers interviewed, however, were farming in excess of 150 scheduled hectares.

7.7.8 **Income Aspirations:** Income targets, which are established when considering the economic and financial implications of irrigation projects, are set according to the following accepted principles, (Backeberg, 1989):

> *...the satisfying of increased real consumer spending over time and the optimising of net cash receipts for reinvestment in the enterprise.*

The impression was gained that the income aspirations of the farmers were conservative and realistic.

7.8 INDIVIDUAL FARMER RANKINGS, ORANGE RIVER IRRIGATION AREA

The rankings developed by means of SAPFACT are presented in the tables and include short interpretive notes similar to those that might be drawn up by an irrigation engineer, planner or counsellor after an open-ended interview with a farmer. The ranking sheet should preferably be discussed with the farmer as soon as possible; immediately after the interview is best.

7.8.1 **Farmer No 1** (see Table 7.1). The present financial situation is sound, and he enjoys farming. He prefers an intuitive approach to decision-making and is reluctant to spend time scratching out facts admits that he never seeks advice but the fact that he is still in business proves that he must be doing the right things. Supervision and maintenance are very good, but peak periods can be worrying. Possibly taking time out to come to grips with the basic principles of irrigation and scheduling would pay off in terms of peace of mind and efficiency.

His relationship with his labourers is excellent but he does not seem to be using them to full advantage, and he could develop them further and make them part of the management team. The personal effort put into supervision could be counter-productive, if office administration and record keeping suffers as a result. Crop production is satisfactory but some innovation in crop selection, or increased exploitation of the pivots is desirable. Specialist advice could be useful. Equipment is well maintained, and the specifications and performance of the pivots are now satisfactory. Closer control of water management could reduce costs and improve production.

This is a successful farmer but participative counselling for a period, concentrating on irrigation management and cropping development, could be of considerable value.

IRRIGATION MANAGEMENT	* * *	LABOUR MANAGEMENT	* * *
CROP PROFIT POTENTIAL	* *	FARMER SITUATION	* *
GENERAL MANAGEMENT	* *	FINANCIAL ASPECTS	* * * *

7.8.2 **Farmer No 2** (see Table 7.2). This farmer does not need counselling, but welcomes any opportunity to discuss his activities. He could well serve as a role model. The farm has 150 hectares under pivot irrigation and any reservations in connection with crop profit potential are related to natural resources, not management. He has sufficient abiliity to combine 200 % land occupancy with the inclusion of soya and groundnuts in the rotation. Yields are above average.

IRRIGATION MANAGEMENT	* * * *	LABOUR MANAGEMENT	* * *
CROP PROFIT POTENTIAL	* * *	FARMER SITUATION	* * * *
GENERAL MANAGEMENT	* * * *	FINANCIAL ASPECTS	* * * *

7.8.3 **Farmer No 3** (see Table 7.3). This is a 150 hectares farm, and water is pumped from the river. The SAPFACT ranking is unusual in several respects. The farmer is relatively new to irrigation but is reluctant to accept even well qualified advice; he wants positive proof that no risk is involved before accepting recommendations. The result is fairly serious over-irrigation. An innovative approach has, however, been adopted in respect to the incorporation of high value, less

well known crops, and this inevitably increases risk!

IRRIGATION MANAGEMENT	• •	LABOUR MANAGEMENT	•
CROP PROFIT POTENTIAL	• •	FARMER SITUATION	• •
GENERAL MANAGEMENT	• •	FINANCIAL ASPECTS	• •

It is to be doubted if this farmer would take kindly to counselling unless a way could be found to demonstrate to him more scientific irrigation management.

7.8.4 **Farmer No 4** (see Table 7.4). A very experienced practical farmer who, over time, has developed a sound knowledge of irrigation. His Sunday afternoon relaxation is to check up on the irrigation status of the crops. Irrigation management is based on BEWAB supported by weekly A-pan readings. Labour management is the only aspect which is out of line, and the farmer was concerned about this. He considers his people competent, but they tend to move on.

The farmer has always made use of specialist advice, and is a useful source of information about practices and problems in the area.

IRRIGATION MANAGEMENT	• • • •	LABOUR MANAGEMENT	•
CROP PROFIT POTENTIAL	• • •	FARMER SITUATION	• • •
GENERAL MANAGEMENT	• • • •	FINANCIAL ASPECTS	• • • •

7.8.5 **Farmer No 5** (see Table 7.5). It is virtually impossible to fault this farmer. He is particularly strong in his ability to apply sound irrigation principles with his only instrument being a soil auger. The farmer has developed his own approach which he continues to apply (with great success) despite being aware of the various scientific methods available.

IRRIGATION MANAGEMENT	• • • •	LABOUR MANAGEMENT	• • •
CROP PROFIT POTENTIAL	• • • •	FARMER SITUATION	• • • •
GENERAL MANAGEMENT	• • • •	FINANCIAL ASPECTS	• • • •

7.8.6 **Farmer No 6** (see Table 7.6). This was originally a large grazing farm on the left bank. When water became available, some 300 hectares of suitable land was put under pivots, the main objective being the production of lucerne grazing for sheep. The farmer is of the opinion that the lucerne has covered irrigation operating costs, maize has broken even and wheat has shown a profit. The farmer believes he over-irrigated until he received "hands-on" counselling, and would undoubtedly welcome further support.

IRRIGATION MANAGEMENT	• • •	LABOUR MANAGEMENT	• •
CROP PROFIT POTENTIAL	• •	FARMER SITUATION	• • • •
GENERAL MANAGEMENT	• • • •	FINANCIAL ASPECTS	• • • •

7.8.7 **Farmer No 7** (see Table 7.7) This was the only farmer interviewed who had recently purchased his property and consequently had substantial liabilities. His strength lay in his financial management, record keeping and strategic planning. He was willing to delegate much of the day-to-

day activities to a supportive labour force. A vulnerability was irrigation management. In many respects his was a reverse image of the normal pattern encountered in the area.

IRRIGATION MANAGEMENT	• •	LABOUR MANAGEMENT	• • •
CROP PROFIT POTENTIAL	• •	FARMER SITUATION	• •
GENERAL MANAGEMENT	• • •	FINANCIAL ASPECTS	• •

7.8.8 Farmer No 8 (see Table 7.8) An experienced farmer, with extensive understanding of irrigation, very strong on record keeping, particularly irrigation. He has investigated all possibilities of introducing permanent crops and has developed a vineyard on an experimental basis. Cold has been a problem, even for the field crops. He would co-operate with a counsellor, but would have *no reason to subscribe to irrigation services.*

IRRIGATION MANAGEMENT	• • • •	LABOUR MANAGEMENT	• • •
CROP PROFIT POTENTIAL	• •	FARMER SITUATION	• • •
GENERAL MANAGEMENT	• • • •	FINANCIAL ASPECTS	• •

7.8.9 Comparative Rankings - Individual Farmers Orange River Irrigation Area

The SAPFACT aspect rankings of five of the farmers are presented graphically in Figure 7.1.

This is followed by Tables 7.1 - 8 containing the detailed SAPFACT rankings of the farmers discussed in paragraphs 7.8.1 - 7.8.8.

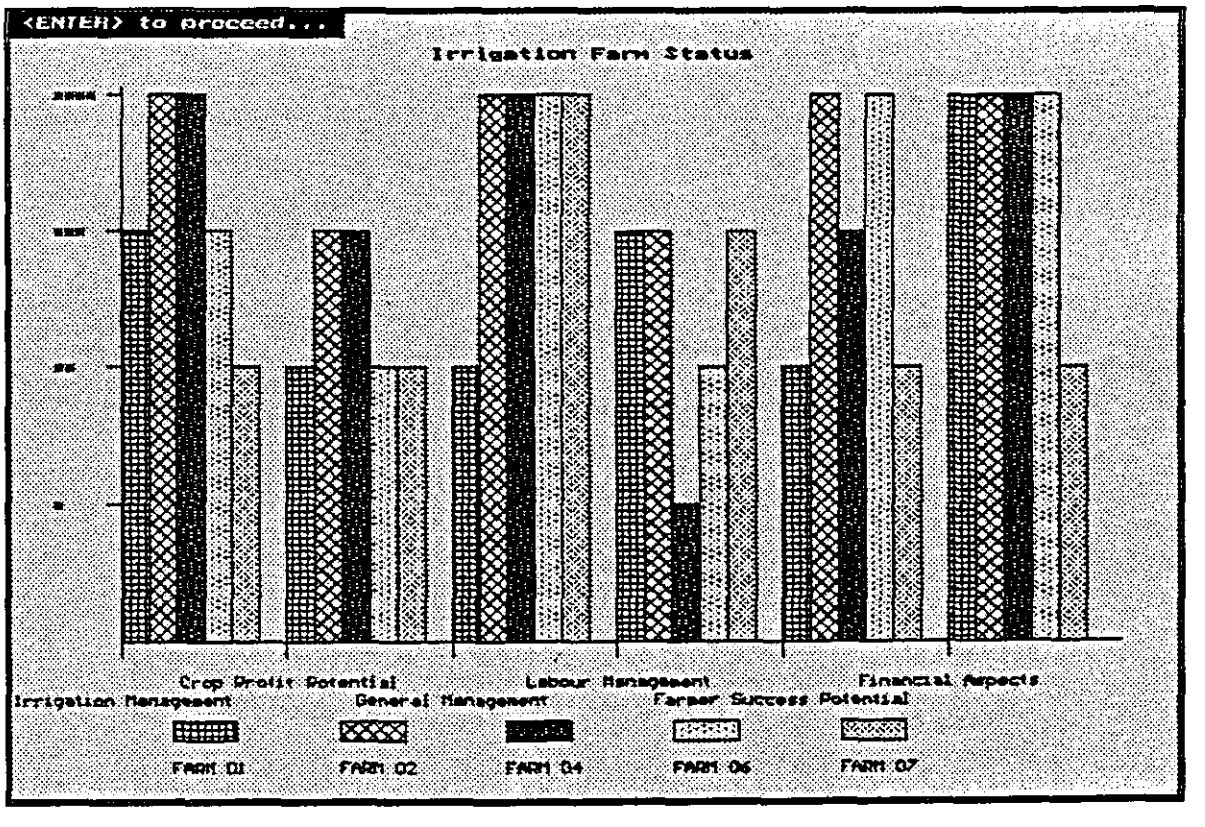

FIGURE: 7.1 SAPFACT RANKINGS ORANGE RIVER IRRIGATION AREA

IRRIGATION MANAGEMENT	* * *	**LABOUR MANAGEMENT**	* * *
Water Supply & Equipment	* * * *	Labour Relations	* * * *
Irrigation Know-How	* *	Labour Development	* *
Irrigation Equipment	* * *	Labour Force	* * *
Water Supply	* * * *	Service Conditions	* * * *
Approach to Irrigation	* *	Development Actions	* *
Methods and Scheduling	* *	Management Participation	* * *
Operation/Maintenance	* * *	Labour Organisation	* * *
Design/Installation	* * *	Labour Situation	* * *
Annual Water Supply	* * * *	Attitude to Legislation	* * * *
Delivery of Water	* * *	Renumeration	* * *
Irrigation Understanding	* * *	Development Actions	* *
Attitude Water Management	* *	Training Inputs	* * *
Irrigation Methods	* * *	Efficiency Contribution	* * *
Scheduling Practices	* *	Supervisory Contribution	* * *
CROP PROFIT POTENTIAL	* *	**FARMER SITUATION**	* *
Crop Production	* *	Personal Goals	* *
Crop Income	* * *	Personal Relationships	* *
Natural Resources	* * *	Motivation	* * *
Crop Production	* *	Attitudes	* *
Crop Profitability	* * *	Personal Reactions	* *
Risks	* * *	People Relationships	* *
Suitability of Climate	* * *	Farm Way of Life	* * *
Suitability of Soils	* * *	Career Stage	* * *
Crop Possibilities	* *	Property Plans	* * *
Crop Yields	* * *	Decision-making	* *
Input Costs	* * *	Stress	* *
Gross Margin Potential	* * *	Personal/Family Aspects	* * *
Market/Price Risk	* * *	Wife Support	* *
Production Risk	* * *	Community Involvement	* * *
GENERAL MANAGEMENT	* *	**FINANCIAL ASPECTS**	* * * *
Day-to-day Management	* * *	Short Term	* * *
Strategic Management	* *	Long Term	* * * *
Field Management	* * * *	Financial Admin.	* * *
Office Organisation	* *	Cash Flow	* * *
Knowledge Base	* * *	Farm Ownership	* * * *
Operational Management	* *	Income Prospects	* * *
Supervisory Support	* * *	Accounting Services	* * *
Personal Supervision	* * * *	Credit Rating	* * *
Seasonal Planning	* * *	Access to Income	* * *
Record Keeping	* *	Impact of inflation	* * *
Counselling and Advice	* * *	Marketability of Farm	* * *
Training and Experience	* * *	Bond Repayments	* * * *
Management Structures	* *	Scale of Operation	* * *
Long-term Planning	* * *	Income Aspirations	* * *

TABLE: 7.1 SAPFACT PROFILE - ORANGE RIVER IRRIGATION AREA - FARMER No 1

IRRIGATION MANAGEMENT	****	**LABOUR MANAGEMENT**	***
Water Supply & Equipment	****	Labour Relations	****
Irrigation Know-How	****	Labour Development	**
Irrigation Equipment	****	Labour Force	***
Water Supply	****	Service Conditions	****
Approach to Irrigation	****	Development Actions	**
Methods and Scheduling	****	Management Participation	***
Operation/Maintenance	****	Labour Organisation	***
Design/Installation	***	Labour Situation	***
Annual Water Supply	***	Attitude to Legislation	****
Delivery of Water	****	Renumeration	***
Irrigation Understanding	****	Development Actions	**
Attitude Water Management	***	Training Inputs	**
Irrigation Methods	****	Efficiency Contribution	***
Scheduling Practices	***	Supervisory Contribution	***
CROP PROFIT POTENTIAL	***	**FARMER SITUATION**	****
Crop Production	***	Personal Goals	****
Crop Income	***	Personal Relationships	****
Natural Resources	***	Motivation	****
Crop Production	***	Attitudes	****
Crop Profitability	***	Personal Reactions	****
Risks	***	People Relationships	****
Suitability of Climate	***	Farm Way of Life	****
Suitability of Soils	***	Career Stage	****
Crop Possibilities	**	Property Plans	****
Crop Yields	****	Decision-making	****
Input Costs	***	Stress	****
Gross Margin Potential	***	Personal/Family Aspects	****
Market/Price Risk	***	Wife Support	****
Production Risk	***	Community Involvement	***
GENERAL MANAGEMENT	****	**FINANCIAL ASPECTS**	****
Day-to-day Management	****	Short Term	****
Strategic Management	****	Long Term	****
Field Management	****	Financial Admin.	****
Office Organisation	****	Cash Flow	****
Knowledge Base	****	Farm Ownership	****
Operational Management	****	Income Prospects	***
Supervisory Support	***	Accounting Services	***
Personal Supervision	****	Credit Rating	****
Seasonal Planning	****	Access to Income	***
Record Keeping	****	Impact of inflation	****
Counselling and Advice	****	Marketability of Farm	***
Training and Experience	***	Bond Repayments	****
Management Structures	***	Scale of Operation	***
Long-term Planning	***	Income Aspirations	***

TABLE: 7.2 SAPFACT PROFILE - ORANGE RIVER IRRIGATION AREA - FARMER No 2

IRRIGATION MANAGEMENT	• •	**LABOUR MANAGEMENT**	•
Water Supply & Equipment	• • •	Labour Relations	•
Irrigation Know-How	•	Labour Development	•
Irrigation Equipment	• • •	Labour Force	• •
Water Supply	• • •	Service Conditions	•
Approach to Irrigation	• •	Development Actions	•
Methods and Scheduling	•	Management Participation	•
Operation/Maintenance	• • •	Labour Organisation	• •
Design/Installation	• • •	Labour Situation	• •
Annual Water Supply	• • •	Attitude to Legislation	•
Delivery of Water	• • •	Renumeration	• •
Irrigation Understanding	• •	Development Actions	•
Attitude Water Management	• •	Training Inputs	• •
Irrigation Methods	• •	Efficiency Contribution	• •
Scheduling Practices	•	Supervisory Contribution	•
CROP PROFIT POTENTIAL	• •	**FARMER SITUATION**	• •
Crop Production	• •	Personal Goals	• •
Crop Income	• •	Personal Relationships	• • •
Natural Resources	• •	Motivation	• •
Crop Production	• • •	Attitudes	• •
Crop Profitability	• • •	Personal Reactions	• • •
Risks	• •	People Relationships	• • •
Suitability of Climate	• • •	Farm Way of Life	• • • •
Suitability of Soils	• •	Career Stage	•
Crop Possibilities	• • •	Property Plans	• • •
Crop Yields	• • •	Decision-making	• •
Input Costs	• • •	Stress	• •
Gross Margin Potential	• • •	Personal/Family Aspects	• • • •
Market/Price Risk	• •	Wife Support	• • • •
Production Risk	• •	Community Involvement	• •
GENERAL MANAGEMENT	• •	**FINANCIAL ASPECTS**	• •
Day-to-day Management	• • •	Short Term	• •
Strategic Management	• •	Long Term	• •
Field Management	• • •	Financial Admin.	• •
Office Organisation	• • •	Cash Flow	• • •
Knowledge Base	• •	Farm Ownership	• •
Operational Management	• •	Income Prospects	• • •
Supervisory Support	• • •	Accounting Services	• •
Personal Supervision	• • •	Credit Rating	• • •
Seasonal Planning	• • •	Access to Income	• • •
Record Keeping	• • •	Impact of inflation	• • •
Counselling and Advice	• • •	Marketability of Farm	• •
Training and Experience	• •	Bond Repayments	• • •
Management Structures	• • •	Scale of Operation	• • •
Long-term Planning	• •	Income Aspirations	• • •

TABLE: 7.3 SAPFACT PROFILE - ORANGE RIVER IRRIGATION AREA - FARMER No 3

IRRIGATION MANAGEMENT	*** * * ***		**LABOUR MANAGEMENT**	*****	
Water Supply & Equipment	* * * *		Labour Relations	* *	
Irrigation Know-How	* * * *		Labour Development	*	
Irrigation Equipment	* * * *		Labour Force	* *	
Water Supply	* * * *		Service Conditions	* * *	
Approach to Irrigation	* * * *		Development Actions	*	
Methods and Scheduling	* * * *		Management Participation	* *	
Operation/Maintenance	* * * *		Labour Organisation	* *	
Design/Installation	* * *		Labour Situation	* * *	
Annual Water Supply	* * * *		Attitude to Legislation	* * *	
Delivery of Water	* * * *		Renumeration	* * *	
Irrigation Understanding	* * * *		Development Actions	*	
Attitude Water Management	* * * *		Training Inputs	* *	
Irrigation Methods	* * * *		Efficiency Contribution	* * *	
Scheduling Practices	* * * *		Supervisory Contribution	* *	
CROP PROFIT POTENTIAL	*** * ***		**FARMER SITUATION**	*** * ***	
Crop Production	* * *		Personal Goals	* * * *	
Crop Income	* * *		*Personal Relationships*	* *	
Natural Resources	* * *		*Motivation*	* * *	
Crop Production	* * *		Attitudes	* * * *	
Crop Profitability	* * *		Personal Reactions	* * *	
Risks	* * *		People Relationships	* *	
Suitability of Climate	* * *		Farm Way of Life	* * *	
Suitability of Soils	* * *		Career Stage	* * *	
Crop Possibilities	* * *		Property Plans	* * *	
Crop Yields	* * *		Decision-making	* * *	
Input Costs	* * *		Stress	* * *	
Gross Margin Potential	* * *		Personal/Family Aspects	* * *	
Market/Price Risk	* * *		Wife Support	* * *	
Production Risk	* * *		Community Involvement	* *	
GENERAL MANAGEMENT	*** * * ***		**FINANCIAL ASPECTS**	*** * * ***	
Day-to-day Management	* * * *		Short Term	* * * *	
Strategic Management	* * * *		Long Term	* * * *	
Field Management	* * *		Financial Admin.	* * * *	
Office Organisation	* * * *		Cash Flow	* * * *	
Knowledge Base	* * * *		*Farm Ownership*	* * * *	
Operational Management	* * *		Income Prospects	* * *	
Supervisory Support	* *		Accounting Services	* * *	
Personal Supervision	* * * *		*Credit Rating*	* * * *	
Seasonal Planning	* * * *		Access to Income	* * *	
Record Keeping	* * *		Impact of inflation	* * * *	
Counselling and Advice	* * * *		Marketability of Farm	* * *	
Training and Experience	* * *		Bond Repayments	* * * *	
Management Structures	* * *		Scale of Operation	* * *	
Long-term Planning	* * *		Income Aspirations	* * *	

TABLE: 7.4 - SAPFACT PROFILE ORANGE RIVER - FARMER No 4

IRRIGATION MANAGEMENT	*** * * ***		**LABOUR MANAGEMENT**	*** * ***	
Water Supply & Equipment	* * * *		Labour Relations	* * *	
Irrigation Know-How	* * * *		Labour Development	* * *	
Irrigation Equipment	* * * *		Labour Force	* * *	
Water Supply	* * *		*Service Conditions*	* * *	
Approach to Irrigation	* * * *		Development Actions	* * *	
Methods and Scheduling	* * * *		Management Participation	* * *	
Operation/Maintenance	* * * *		Labour Organisation	* * *	
Design/Installation	* * * *		Labour Situation	* * *	
Annual Water Supply	* * *		Attitude to Legislation	* * *	
Delivery of Water	* * *		Renumeration	* * *	
Irrigation Understanding	* * * *		Development Actions	* * *	
Attitude Water Management	* * * *		Training Inputs	* * *	
Irrigation Methods	* * * *		Efficiency Contribution	* * *	
Scheduling Practices	* * *		Supervisory Contribution	* *	
CROP PROFIT POTENTIAL	*** * * ***		**FARMER SITUATION**	*** * * ***	
Crop Production	* * * *		Personal Goals	* * * *	
Crop Income	* * *		*Personal Relationships*	* * *	
Natural Resources	* * *		Motivation	* * * *	
Crop Production	* * * *		Attitudes	* * * *	
Crop Profitability	* * *		Personal Reactions	* * *	
Risks	* * *		People Relationships	* * *	
Suitability of Climate	* * *		Farm Way of Life	* * * *	
Suitability of Soils	* * *		Career Stage	* * * *	
Crop Possibilities	* * *		Property Plans	* * *	
Crop Yields	* * * *		Decision-making	* * * *	
Input Costs	* * *		Stress	* * *	
Gross Margin Potential	* * *		Personal/Family Aspects	* * *	
Market/Price Risk	* * *		Wife Support	* * *	
Production Risk	* * *		Community Involvement	* * *	
GENERAL MANAGEMENT	*** * * ***		**FINANCIAL ASPECTS**	*** * * ***	
Day-to-day Management	* * * *		Short Term	* * * *	
Strategic Management	* * * *		Long Term	* * * *	
Field Management	* * *		Financial Admin.	* * *	
Office Organisation	* * * *		Cash Flow	* * * *	
Knowledge Base	* * * *		Farm Ownership	* * * *	
Operational Management	* * *		Income Prospects	* * *	
Supervisory Support	* *		Accounting Services	* * *	
Personal Supervision	* * * *		Credit Rating	* * *	
Seasonal Planning	* * * *		Access to Income	* * *	
Record Keeping	* * *		Impact of inflation	* * * *	
Counselling and Advice	* * * *		Marketability of Farm	* * *	
Training and Experience	* * * *		Bond Repayments	* * * *	
Management Structures	* *		Scale of Operation	* * *	
Long-term Planning	* * * *		Income Aspirations	* * *	

TABLE: 7.5 - SAPFACT PROFILE ORANGE RIVER - FARMER No 5

IRRIGATION MANAGEMENT	***	**LABOUR MANAGEMENT**	**
Water Supply & Equipment	***	Labour Relations	***
Irrigation Know-How	***	Labour Development	**
Irrigation Equipment	***	Labour Force	***
Water Supply	***	Service Conditions	***
Approach to Irrigation	***	Development Actions	**
Methods and Scheduling	***	Management Participation	**
Operation/Maintenance	***	Labour Organisation	***
Design/Installation	***	Labour Situation	***
Annual Water Supply	***	Attitude to Legislation	***
Delivery of Water	***	Renumeration	***
Irrigation Understanding	***	Development Actions	**
Attitude Water Management	***	Training Inputs	**
Irrigation Methods	***	Efficiency Contribution	***
Scheduling Practices	***	Supervisory Contribution	**
CROP PROFIT POTENTIAL	**	**FARMER SITUATION**	****
Crop Production	**	Personal Goals	***
Crop Income	***	Personal Relationships	****
Natural Resources	***	Motivation	****
Crop Production	**	Attitudes	**
Crop Profitability	**	Personal Reactions	****
Risks	***	People Relationships	****
Suitability of Climate	***	Farm Way of Life	****
Suitability of Soils	***	Career Stage	***
Crop Possibilities	**	Property Plans	*
Crop Yields	***	Decision-making	***
Input Costs	**	Stress	****
Gross Margin Potential	***	Personal/Family Aspects	****
Market/Price Risk	***	Wife Support	***
Production Risk	***	Community Involvement	****
GENERAL MANAGEMENT	****	**FINANCIAL ASPECTS**	****
Day-to-day Management	****	Short Term	****
Strategic Management	***	Long Term	****
Field Management	***	Financial Admin.	****
Office Organisation	***	Cash Flow	****
Knowledge Base	***	Farm Ownership	****
Operational Management	***	Income Prospects	****
Supervisory Support	***	Accounting Services	****
Personal Supervision	****	Credit Rating	****
Seasonal Planning	***	Access to Income	****
Record Keeping	***	Impact of inflation	****
Counselling and Advice	***	Marketability of Farm	****
Training and Experience	***	Bond Repayments	****
Management Structures	***	Scale of Operation	****
Long-term Planning	***	Income Aspirations	****

TABLE: 7.6 - SAPFACT PROFILE ORANGE RIVER AREA - FARMER No 6

IRRIGATION MANAGEMENT	**	**LABOUR MANAGEMENT**	***
Water Supply & Equipment	***	Labour Relations	****
Irrigation Know-How	**	Labour Development	**
Irrigation Equipment	***	Labour Force	****
Water Supply	***	Service Conditions	****
Approach to Irrigation	**	*Development Actions*	**
Methods and Scheduling	**	Management Participation	***
Operation/Maintenance	***	Labour Organisation	***
Design/Installation	***	Labour Situation	****
Annual Water Supply	***	Attitude to Legislation	****
Delivery of Water	***	Renumeration	***
Irrigation Understanding	**	*Development Actions*	**
Attitude Water Management	**	Training Inputs	**
Irrigation Methods	***	Efficiency Contribution	***
Scheduling Practices	**	Supervisory Contribution	***
CROP PROFIT POTENTIAL	**	**FARMER SITUATION**	**
Crop Production	**	*Personal Goals*	**
Crop Income	***	Personal Relationships	**
Natural Resources	***	Motivation	**
Crop Production	**	Attitudes	**
Crop Profitability	***	Personal Reactions	***
Risks	***	People Relationships	**
Suitability of Climate	***	Farm Way of Life	***
Suitability of Soils	***	Career Stage	*
Crop Possibilities	**	Property Plans	***
Crop Yields	**	*Decision-making*	**
Input Costs	***	Stress	***
Gross Margin Potential	***	Personal/Family Aspects	***
Market/Price Risk	***	Wife Support	**
Production Risk	***	Community Involvement	***
GENERAL MANAGEMENT	***	**FINANCIAL ASPECTS**	**
Day-to-day Management	***	Short Term	***
Strategic Management	***	Long Term	*
Field Management	**	*Financial Admin.*	****
Office Organisation	****	Cash Flow	**
Knowledge Base	***	Farm Ownership	**
Operational Management	***	Income Prospects	***
Supervisory Support	***	Accounting Services	****
Personal Supervision	**	Credit Rating	***
Seasonal Planning	***	Access to Income	***
Record Keeping	****	Impact of inflation	*
Counselling and Advice	***	Marketability of Farm	***
Training and Experience	***	Bond Repayments	*
Management Structures	***	*Scale of Operation*	***
Long-term Planning	***	Income Aspirations	***

TABLE: 7.7 - SAPFACT PROFILE ORANGE RIVER AREA - FARMER No 7

IRRIGATION MANAGEMENT	* * * *		**LABOUR MANAGEMENT**	* * *	
Water Supply & Equipment	* * * *		Labour Relations	* * * *	
Irrigation Know-How	* * * *		Labour Development	* *	
Irrigation Equipment	* * * *		Labour Force	* * *	
Water Supply	* * *		Service Conditions	* * * *	
Approach to Irrigation	* * *		Development Actions	* *	
Methods and Scheduling	* * * *		Management Participation	* *	
Operation/Maintenance	* * *		Labour Organisation	* * *	
Design/Installation	* * * *		Labour Situation	* * *	
Annual Water Supply	* * *		Attitude to Legislation	* * * *	
Delivery of Water	* * *		Renumeration	* * *	
Irrigation Understanding	* * *		Development Actions	* *	
Attitude Water Management	* * *		Training Inputs	* *	
Irrigation Methods	* * * *		Efficiency Contribution	* * *	
Scheduling Practices	* * * *		Supervisory Contribution	* *	
CROP PROFIT POTENTIAL	* *		**FARMER SITUATION**	* * *	
Crop Production	* * *		Personal Goals	* * *	
Crop Income	* *		Personal Relationships	* * *	
Natural Resources	* * *		*Motivation*	* * *	
Crop Production	* * *		Attitudes	* * *	
Crop Profitability	* *		Personal Reactions	* * *	
Risks	* * *		People Relationships	* * * *	
Suitability of Climate	* * *		Farm Way of Life	* * *	
Suitability of Soils	* * *		Career Stage	* * *	
Crop Possibilities	* * *		Property Plans	* * *	
Crop Yields	* * *		Decision-making	* * *	
Input Costs	* * *		Stress	* *	
Gross Margin Potential	* *		Personal/Family Aspects	* * *	
Market/Price Risk	* * *		*Wife Support*	* * * *	
Production Risk	* * *		Community Involvement	* * *	
GENERAL MANAGEMENT	* * * *		**FINANCIAL ASPECTS**	* *	
Day-to-day Management	* * *		Short Term	* *	
Strategic Management	* * * *		Long Term	* *	
Field Management	* * *		Financial Admin.	* * *	
Office Organisation	* * * *		Cash Flow	* *	
Knowledge Base	* * * *		Farm Ownership	* * *	
Operational Management	* * *		Income Prospects	* * *	
Supervisory Support	* * *		Accounting Services	* * *	
Personal Supervision	* * *		Credit Rating	* * *	
Seasonal Planning	* * *		*Access to Income*	* * *	
Record Keeping	* * * *		Impact of inflation	* *	
Counselling and Advice	* * * *		Marketability of Farm	* * *	
Training and Experience	* * *		Bond Repayments	* * *	
Management Structures	* * *		Scale of Operation	* * *	
Long-term Planning	* * *		Income Aspirations	* * *	

TABLE: 7.8 - SAPFACT PROFILE ORANGE RIVER AREA - FARMER No 8

CHAPTER 8

NATAL COASTAL AREA

8.1 GENERAL

The bulk of the sugar cane grown along the Natal coast is rain fed, but there are isolated areas where cane is grown under irrigation. Generally the water is pumped from rivers that, in the past 15 years, came under the control of irrigation boards. Later dams were built to stabilise flow.

The interim report, (January 1992) explained the position of farm ownership in this area:

> *All the farmers interviewed had inherited their farms. In some cases the farmers were third or fourth generation on the land. That there was a core enterprise in the family had clearly been a key element in the farmers' ability to keep head above water in what was generally felt to be a tough economic climate. The heavy component of own capital from the outset was thus extremely significant.*

Sugar cane was the main crop grown, but all the farmers interviewed were progressively increasing the area under high value, and more profitable, crops such as citrus or vegetables. The crops are all relatively labour intensive so that labour management is important.

Cane irrigation along the Natal coast has a character all of its own. It is not very scientific. In practice, farmers and their advisors seem to have standardised on an approach which has been economically acceptable. Hand- or drag-line sprinkler systems are used in the cane.

The SA Sugar Association has undertaken internationally recognised irrigation research and their advisory service has, for many years, used a simulation programme to assess the yield losses arising from under-irrigation in peak periods, so that farmers can literally take calculated risks!

Some general characteristics became evident. There could be no doubt as to the inherent knowledge and ability of the farmers and the soundness of their financial position but, in most cases, their SAPFACT rating for irrigation-, general- and labour-management was relatively low. This may be because sugar has been a "comfortable" crop that provided reasonable returns without the need to strive for higher yields or greater efficiency. The inclusion of citrus and vegetables with higher management demands in the enterprise mix did seem to sharpen management approaches. Typically, the large number of employees on relatively modest sized farms promoted the continuation of the traditional approaches to managing and motivating "gangs" of relatively unskilled labour.

8.2 IRRIGATION MANAGEMENT ASPECT NATAL COASTAL AREA

The approach to irrigating cane was very well explained by one of the farmers:

> ***We try to complete a cycle in about 14 days, irrigating day and night for six days of the week. We aim at a stand time of 12 hours, the pipes being moved in the morning and again in the evening but, in practical terms, it does not work quite like that. The days seem to be shorter than the nights for some reason.*** *It is difficult to get people to work very early in the morning, and in the evening again!*
>
> *It is more supplementary than total irrigation on the cane. We can't apply sufficient water in really dry hard periods; we are always behind.* ***To be able to do a total irrigation, we would have a much higher ESCOM account and require probably at least 50% more equipment and upgraded pumps.*** *I doubt if that would be economical in terms of the return. So you have got to take a bit of a chance. So maybe we lose a little bit of production because we can't apply full irrigation at peak periods.*

Citrus and vegetables are irrigated using normal sprinkler, micro and drip irrigation but few farmers are using scheduling aids, and most rely on experience and empirical advice. It is probable that both yield and quality could be improved with more attention to irrigation management.

8.2.1 **Equipment Operation and Maintenance:** Maintenance appeared to be up to "normal" standards, but is not as critical as it is in some areas. The irrigation is, to a large extent, supplemental, the permanent crops are not over-sensitive to limited periods of stress and while repair facilities are conveniently located. Not all the farmers interviewed were prepared to accept the additional attention demanded by micro irrigation on citrus, and had reverted to under-tree sprinklers. Dragline sprinkler systems were the accepted standard in cane but rat damage to hoses was a problem and there is no easy way of irrigating in a cane field.

8.2.2 **Equipment Design and Installation:** All the farmers relied heavily on the equipment suppliers for advice on system selection and specification. They believe they are well served by experienced suppliers who appreciate that adverse comment spreads quickly through a community. Farmers were appreciative of suppliers who were willing to consult with them in developing new systems. Problems tended to arise when farmers were forced by financial circumstances to stipulate a ceiling price for a system, and ended up with sub-standard specifications. In some cases, irrigation systems had developed over a period of time and existing mains were retained when permanent laterals and draglines replaced the original hand lines. Inevitably, these systems had limitations.

8.2.3 **Annual Water Supply:** The very severe droughts experienced in this area since the 1970's led to the establishment of irrigation boards that originally regulated the use of limited river flow. These measures were only partly successful and the boards built storage dams that have gone a long way towards ensuring adequate water supplies.

8.2.4 **Water Delivery:** In one of the areas visited, the irrigation board operated a well managed

canal but there were interruptions in deliveries on occasions when repair work had to be carried out. These interruptions and the timing of deliveries were not a major problem with permanent crops, but are a vulnerability in the case of specialised vegetable crops. Most of the water is pumped by the farmer so that water supply is a function of pump reliability. The recently introduced off-peak electricity tariffs have had considerable implications for the cost of pumping and the management of water delivery.

8.2.5 Understanding Irrigation: Most of the farmers had an elementary grasp of plant/soil/water relationships and applied this to practical day-to-day management actions. There was an awareness that, during the season, the stand times should be varied to match demand and soil capacity, and that it was wasteful to irrigate immediately after rain. On the whole, however, there was acceptance of irrigation system design capacity and rule of thumb operating procedures. Cane yields were lower than what could be expected and farmers ascribed this to climatic factors such as cloudiness, but the far more likely reason, confirmed by agronomists, is inept irrigation management, resulting from a lack of an understanding of basic principles.

8.2.6 Attitude to Water Management: There was an awareness of the importance of water as a natural resource and a production input, and all the farmers interviewed had played a role in the development of irrigation boards and the assurance of water supplies. Water use efficiency was, however, related more to pumping costs than water conservation. The feeling amongst farmers seemed to be that, in normal years, they now have adequate water supplies and that there was little they could do, at farm level, to counter major droughts.

8.2.7 Irrigation Methods: The progression to drag-line sprinkler systems in cane has been evolutionary and the system is well understood by designers, suppliers and farmers. There are practical difficulties but the method can be considered to be "state of the art" for the present levels of irrigation technology in this area. Irrigation of vegetables and citrus is conventional, with hand-line sprinklers still being utilised, but drip and micro now being more common.

8.2.8 Scheduling Practices: Some of the farmers had a guilty feeling that they should be making more use of A-pans in managing cane irrigation, and of tensiometers in citrus. This is probably not of major importance in practice. What is important is that available information on the water holding capacities of soils and the reaction of the permanent crops to water stress should be better understood and utilised in irrigation management. An implication is that this would involve some instrumentation and measurements.

8.3 CROP PROFIT POTENTIAL ASPECT, NATAL COASTAL AREA

Cane is a stable but not very profitable crop. The A and B quota system has had an artificial influence on production patterns, as the emphasis was on achieving A-quota levels of production at minimum cost, and with the least possible physical and management inputs. The one viable alternative to cane appears to be citrus on the North Coast, while there has been a swing to vegetables on the South Coast. The introduction of alternative crops has had a significant influence on the development of irrigation systems and on the pattern of soil utilisation. The availability of

irrigation has been important in making diversification possible.

8.3.1 **Suitability of Climate:** The climate is suitable for cane, particularly if irrigation is available to maintain production in severe drought periods. There is a suggestion that the climate is too cool to permit top yields but there are, nevertheless, indications that present production falls short of potential. The climate is particularly suited to the production of high-quality export grapefruit and is, traditionally, banana country. None of the farmers interviewed were, however, producing bananas.

8.3.2 **Suitability of Soils:** Soils in the area are very variable both, in texture and depth, and this militates against a scientific approach to irrigation. In addition, the topography, even in the river valleys, is anything but flat. Despite this, effective production under irrigation is achieved. Farmers do take soils into account when considering alternative crops and the SA Sugar Association provides a sophisticated land-use planning service. Generally, in the SAPFACT rankings, the soils have been considered to be "acceptable".

8.3.3 **Crop Possibilities:** As already indicated in the introduction to this section, there are alternative crops to cane and it can be expected that the search for others will continue.

8.3.4 **Crop Yields:** Crop yield levels were modest in the case of cane and reasonable for citrus. This is possibly a reflection of the situation that existed for many years in the area, when cane was a "comfortable" crop and additional management efforts were not particularly rewarding. It is possible that, in the future, pressure on land and concentration on high-value crops will place a premium on achieving high yields.

8.3.5 **Production Costs:** The interviews indicated that, over and above the universal problem of escalating input costs, transport to sugar mills located at a distance could determine the viability of cane as an enterprise. There was a feeling that pumping costs were inflated by the requirement to purchase electricity from local authorities. Crop diversification usually meant the revision of irrigation systems and water supply networks at considerable cost, particularly as cane sprinkler systems were originally "under-designed"!

8.3.6 **Gross Margin Potential:** Areas under irrigation varied from 117 hectares sugar and 21 citrus, up to 266 hectares sugar and 103 citrus, a significant difference in gross margin potential. The larger farm could afford management structures and strategies which would not have been realistic on the smaller farm.

8.3.7 **Market / Price Risk:** Sugar and citrus are reasonably "safe bets". Citrus is largely dependent on export markets, but this is not regarded as a vulnerability. Vegetables are another matter, despite reasonable proximity to markets. Specialised products for export were a proposition but the local market was haunted by the dangers of over-production. Two farmers interviewed had been successful with cabbages as a catch crop between ratoons, largely because vendors

purchased up to half the crop on-farm.

8.3.8 Production Risk: Cane is a low-risk crop except in the case of very severe droughts, but citrus requires dedicated management. Vegetables are generally not without risk, but cabbages are robust.

8.4 GENERAL MANAGEMENT ASPECT, NATAL COASTAL AREA

Where cane was the major enterprise, management was largely concentrated on organising a large labour force (in the order of 100 people) and the logistics of harvesting and transporting the cane. Irrigation management was largely routine. Where there was a large citrus component, management of irrigation and spraying programmes required significant attention and there was the added complication of a packhouse.

8.4.1 Supervisory Support: An organisation with a considerable number of permanent employees cannot be supervised by one man; he must have support. In some cases this was provided by sons, or even wives, supported by long-serving employees with varied training and competence. In this area, where all the farms had relatively large numbers of employees, supervisory support was a key factor, which ranged from virtually none to considerable.

8.4.2 Personal Supervision: The desire and the ability to supervise the day-to-day activities not of only labourers but also of junior supervisors is one of the keys to success. In the case of the farmers interviewed, and they were all successful farmers, personal supervision was rated as "reasonable", although not one was categorised as "committed."

8.4.3 Seasonal Planning: Seasonal planning was largely limited to routine activities and the timely acquisition of requisites because permanent crops do not permit seasonal changes in strategy to meet market or climatic variations.

8.4.4 Record-Keeping: All the farmers interviewed kept adequate records including labour records, sometimes computer based, but none made a fetish of record-keeping. In the case of permanent crops, the norms required for planning activities and placing orders probably become well-established over time.

8.4.5 Counselling and Advice: The farmers interviewed were all prepared to seek and take advice on technical and management matters, although it was understood that there were farmers in the area who avoided extension because they felt it might disclose their lack of technical knowledge. The main interest was in crop and variety selection and management, with irrigation taking a back seat. Irrigation counselling, on a one-on-one basis, was not available, although the SA Sugar Association provided good irrigation planning and extension advice.

8.4.6 Training and Experience: All the farmers interviewed had sufficient training and experience for their task. Interestingly enough, only one had an agricultural diploma, while two had technical training in mechanical engineering, one had a business background, and two went farming straight from school. Nearly all had worked under their fathers or had had other farming experience before taking over the farm.

8.4.7 Management Structures: Because of the large workforces involved, there was more evidence here of definite management structures than is normally found on farms. A division of responsibility between family members was not uncommon. Experienced employees had become members of the management team and enjoyed enhanced status and privileges, while some wives had definite administrative and managerial responsibilities.

8.4.8 Long-term Planning: Long term-planning seemed to be confined to the identification of new enterprise possibilities with a view to vertical expansion, updating of irrigation systems and succession planning. There was little evidence of planning for horizontal expansion.

8.5 LABOUR MANAGEMENT ASPECT, NATAL COASTAL AREA

Irrigation farming in this area is labour-intensive and labour management is of particular significance. In most other irrigation areas there has been a trend towards a reduction in permanent labour, with a consequent upgrading of abilities and responsibilities. It may be unfair to judge the approach to labour management in this area by the same standards, although at least one of the farmers interviewed had developed management to a level that compared favourably with anything found elsewhere in the country. This is not to say that labour relationships were poor. They were good, but tended to be "feudal" and, because people were being dealt with as a group, training and general development seemed to lag.

8.5.1 Labour Organisation; There were farms where committees had been established under the auspices of the Rural Foundation and others were organisations similar to those envisaged by legislation were already in place. In general, however, the "normal" pattern of farm labour organisation and communication was the order of the day.

8.5.2 Labour Situation: At the time of the survey, few problems were being experienced with either permanent or seasonal labour; the situation was satisfactory. Some tasks were more acceptable than others, and farmers had their work cut out finding people willing to undertake the more unpleasant or physically tiring jobs. Local women perceived picking as being a heavy and menial job and a farmer anticipated having to increase wages in order to attract sufficient hands. On one of the cane/citrus farms, the cutters had been Pondos but relationships with the other workers had led to a change in policy. Irrigation system workers were paid less than cutters because the work was less physically taxing but quite elderly people were useful because maintaining the citrus microjets required meticulous attention to detail.

8.5.3 Attitude to Legislation: The farmers, at the time of the interviews, were understandably cautious about the impact of legislation. This was not based on opposition to the principles involved, but rather to the hard realities of unrealistic minimum wage demands that could not be met. There were also fears that the differences between a factory operation and a farm would not be fully appreciated and the delicate balance between farmers and workers disturbed by injudicious legislation.

8.5.4 Remuneration: The situation was difficult to assess. Wages and benefits were in line with farm practice over the years but it is doubted if this will be acceptable in the future. The impact could be far-reaching and change the labour-intensive nature of farming in this area. An increase in the wages of 100 or more workers has obvious economic implications and limitations. Mechanisation is possible, and may be no more uneconomical than major increases in remuneration.

8.5.5 Development Actions: The pro-active development of employees as individuals with the specific objective of enhancing their participation in all aspects of farming operations, including management, appeared to be lagging behind what is desirable. This is understandable under the circumstances, but there were farms where efficiency had been enhanced by following this policy.

8.5.6 Training Inputs: Training was only mentioned in passing in the interviews but it is known that the SA Sugar Association and commercial organisations have developed and promoted specialised training programmes and that there has been wide participation.

8.5.7 Efficiency Contribution: The first test of the effectiveness of labour management is the extent to which labour contributes positively to the attainment of overall enterprise efficiency. There were farms where the entire approach was geared to achieving this objective, and where people- development and good communication had shown positive results. There were also farms where the success of the enterprise depended almost entirely on the energetic inputs of the farmer personally.

8.5.8 Supervisory Contribution: In general, labour did not make a major contribution to the supervision function but there were two farms where employees were very much part of management. On one, the "middle management" responsibility for the cane enterprise was in the hands of an employee who had come up through the ranks, as had two supervisors with extensive authority. On the other, three employees with some thirty years service each form the management team with the farmer, one being specifically responsible for 300 hectares of sprinkler irrigation. It is possibly no coincidence that both these farms ranked well in all SAPFACT factors concerned with management.

8.6 FARMER SITUATION ASPECT, NATAL COASTAL AREA

All the farmers interviewed impressed as people and managers who were operating well within themselves and could call on hidden reserves should changing circumstances make this necessary.

8.6.1 Farm Way of Life: There was general agreement that the living circumstances and the daily challenge made farming attractive, despite periodic setbacks.

8.6.2 Career Stage: The farmers were either in mid-career or preparing to hand over to their sons. There was evidence that some of the older farmers were coasting, knew what needed to be done but were quite happy to leave execution to the next generation! Age and career stage did not necessarily change a farmer's way of doing things. There were innovative old farmers and conservative mid-career farmers amongst those interviewed.

8.6.3 Property Plans: At the time of the survey, none of the farmers were considering selling or purchasing additional land. The mood was one of consolidation and vertical expansion, through the addition of profitable enterprises, selective land use and improved irrigation systems.

8.6.4 Decision-Making: There is a settled pattern about permanent crops such as cane and citrus and, once the step leading to the phasing in of a new enterprise has been taken, there is little need for urgent decisions requiring an extensive data base. In this area, one gets the impression that policy decisions are often taken by the community as a group in the common interest.

8.6.5 Stress: There was no indication that the farmers came from communities where stress was a common complaint. Where there was stress, it was people-related, as is to be expected in a labour-intensive farming area subject to violence and political change.

8.6.6 Personal / Family Aspects: This is a highly personal matter but the impression gained was one of close-knit supportive families and communities.

8.6.7 Support Given by Wife: A wife is very often a "director" of a farming business and her direct and indirect support of her husband can be an important factor in determining success. There was at least one example of a wife who played an important part in the day-to-day management of a large and succeessful farm.

8.6.8 Community Involvement: Participation in irrigation board activities, soil conservation committees and farmer's associations seemed to be taken for granted by the farmers interviewed. These activities were undoubtedly mutually beneficial.

8.7 FINANCIAL ASPECTS, NATAL COASTAL AREA

In the absence of detailed financial information, all that could be done was to make a broad judgement of the farmer's position. Probably because farms had been inherited or bought many years ago, and because cane is a relatively stable crop, all the farmers appeared to be in a sound financial position. Sugar had provided a stable base for the development of new and more profitable enterprises.

8.7.1 Accounting Services: The SA Sugar Association operates a computerised system, Cane Farms, for recording purchases and receipts. Cheques are coded and the farmer receives monthly and annual reports, which he then passes on to his accountant for finalisation. Local consultants have developed management accounting systems and the indications are that the interviewed farmers were interested in these developments.

8.7.2 Credit Ratings: Credit was obtained through normal commercial channels rather than official institutions and, as in the area below the Pk le Roux Dam, did not appear to be an issue.

8.7.3 Access to Income: Farm income appeared to be related to area under irrigation, balance between A and B pool cane and the areas planted to cane, and more profitable alternative crops. The larger, more developed, farms seemed to have an advantage in that there was greater freedom of action.

8.7.4 Impact of Inflation: Inflation was undoubtedly a major factor in enabling the well-established farmers to keep going under difficult circumstances. The farmers were only too well aware of this, and one or two expressed concern as to how much longer they could expect this favourable situation to last.

8.7.5 Marketability of Farm: At the time of the survey, irrigation farmers in some other parts of the country were deeply concerned at the deterioration in the market value of their farms. Older farmers found that they were trapped by not being able to realise their assets. This situation did not seem to apply in the case of the farmers interviewed in Natal, although it can be assumed that there had been a downward trend in farm prices.

8.7.6 Bond Status: The general impression was that few, if any, of the farmers had outstanding bonds and that long-term liabilities were insignificant.

8.7.7 Scale of Operation: The smallest farm involved in the survey had 120 hectare under irrigation and the largest 380 hectare. It is doubtful if a farm with less than 100 hectare would be a proposition under present circumstances.

8.7.8 Income Aspirations: Natal cane farmers, as represented by the farmers included in the survey, appear to have established a comfortable standard of living, equivalent to that of their professional relatives living in Durban. This standard of living appears to be realistic and achievable.

8.8 INDIVIDUAL FARMER RANKINGS, NATAL COASTAL AREA

8.8.1 Farmer No 9 (see Table 8.1). Here we have a farmer who is in a sound financial position largely as a consequence of having developed the farm over a long period and being free of bonds.

Sugar is produced under irrigation and cabbages are a useful addition. He has all the properties neccessary for success and is a logical, well-informed person. When, however, one looks at virtually all the management aspects, it seems that a "good enough" culture has been allowed to develop. This is possibly because of approaching retirement from what has been a successful career as a farmer under the circumstances that prevailed until recently. His son is moving onto the farm and provided he is willing to move with the times and is a dynamic manager, the farm can be very successful.

IRRIGATION MANAGEMENT	• •	LABOUR MANAGEMENT	• •
CROP PROFIT POTENTIAL	• •	FARMER SITUATION	• • •
GENERAL MANAGEMENT	• •	FINANCIAL ASPECTS	• • • •

8.8.2 Farmer No 10 (see Table 8.2). The farmer took over the farm on the death of his father and has developed it into a thriving cane and citrus enterprise. While his irrigation management is not completely conventional, deviations are in line with his experience and requirements. He has built up a three-tiered management hierachy, in which his wife and sons play a prominent executive role, while Indian and black supervisors are very much part of the management team. This is a noteworthy example of effective management. There are all the indications that the financial position is sound but this would need to independently assessed. The approach adopted here illustrates that there is nothing in the enterprises practised in this area that precludes the effective application of acceptable management approaches.

IRRIGATION MANAGEMENT	• • • •	LABOUR MANAGEMENT	• • • •
CROP PROFIT POTENTIAL	• • • •	FARMER SITUATION	• • • •
GENERAL MANAGEMENT	• • • •	FINANCIAL ASPECTS	• • • •

8.8.3 Farmer No 11 (see Table 8.3). Again we have the anomaly that the financial position is quite satisfactory and the farmer has the properties to do very well, but the ratings for all the management factors are mediocre. One misses a dynamic pro-active approach. Could it be that a farmer with this rating pattern has learned to live within himself, and is in harmony with the environment and his needs? His farm is small enough, and still simple enough to be managed by one man. Possibly he is right and we outsiders striving for maximum efficiency are wrong.

IRRIGATION MANAGEMENT	• •	LABOUR MANAGEMENT	• •
CROP PROFIT POTENTIAL	• •	FARMER SITUATION	• • •
GENERAL MANAGEMENT	• •	FINANCIAL ASPECTS	• • •

8.8.4 Farmer No 12 (see Table 8.4). This farmer has broken away from conventional irrigated cane production and opted for a livestock enterprise on irrigated pastures. He is not a young man and is in the process of passing the enterprise on to the next generation. On the face of it, he appears to exemplify carefully planned innovation in the development of new enterprises. One gathers the impression that there is room for counselling on the irrigation of pastures.

IRRIGATION MANAGEMENT	• •	LABOUR MANAGEMENT	• •
CROP PROFIT POTENTIAL	• • • •	FARMER SITUATION	• • • •
GENERAL MANAGEMENT	• • • •	FINANCIAL ASPECTS	• • • •

8.8.5 **Farmer No 13** (see Table 8.5). This farmer has stopped irrigating cane because he can achieve his full A quota dryland and finds pumping costs prohibitive.

IRRIGATION MANAGEMENT	• •	LABOUR MANAGEMENT	• •
CROP PROFIT POTENTIAL	• •	FARMER SITUATION	• • •
GENERAL MANAGEMENT	• •	FINANCIAL ASPECTS	• • •

8.8.6 **Farmer No 14** (see Table 8.6). A very sound cane and citrus farmer approaching the "hand over" stage of his career. Management input is in line with requirements to run a sound enterprise. Citrus has added another dimension to the farm, which could be handicapped by limited turnover as a consequence of size.

IRRIGATION MANAGEMENT	• •	LABOUR MANAGEMENT	• •
CROP PROFIT POTENTIAL	• •	FARMER SITUATION	• • •
GENERAL MANAGEMENT	• • •	FINANCIAL ASPECTS	• • • •

8.9 COMPARATIVE RANKINGS

The comparative SAPFACT rankings of five of the farmers discussed is summarised in Figure 8.1

This is followed by Tables 8.1 - 6 containing the detailed SAPFACT rankings of the farmers discussed in paragraphs 8.8.1 - 8.8.6.

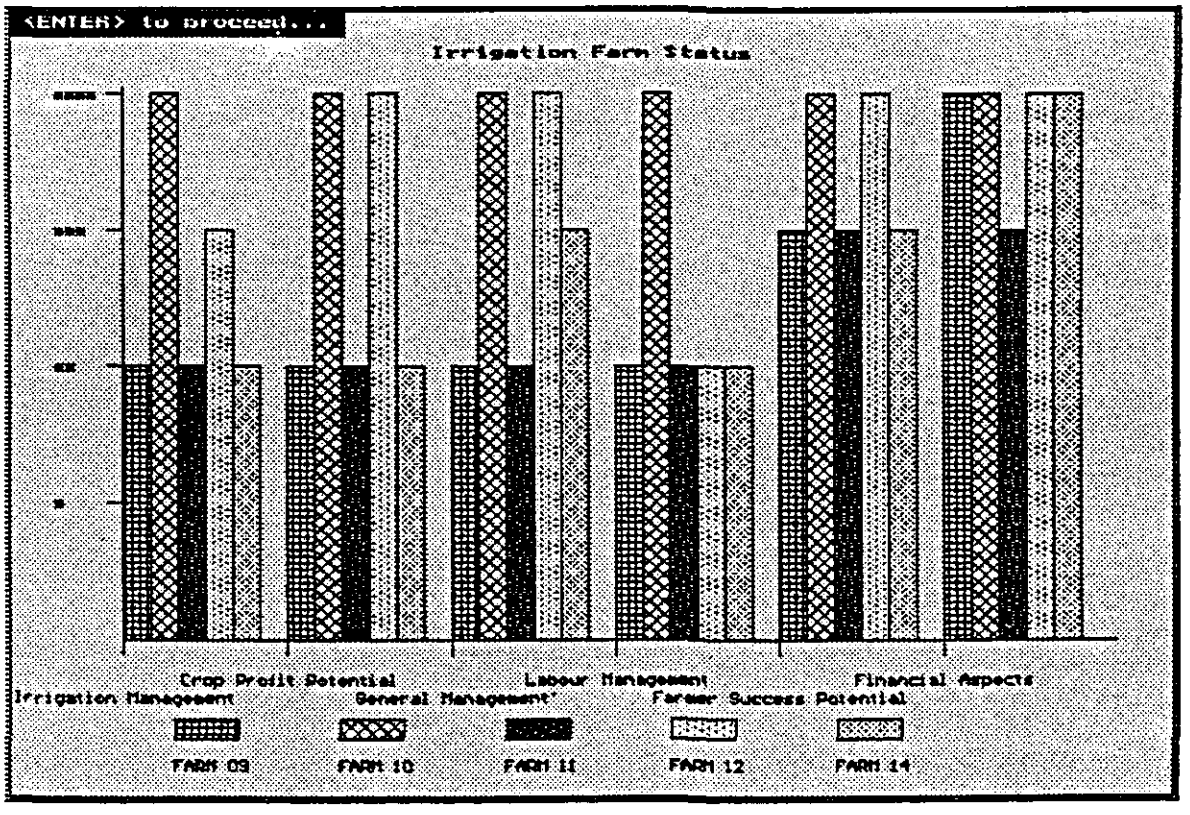

FIGURE 8.1 SAPFACT RANKINGS NATAL COASTAL AREAS

IRRIGATION MANAGEMENT	• •	**LABOUR MANAGEMENT**	• •
Water Supply & Equipment	• •	Labour Relations	• •
Irrigation Know-How	• •	Labour Development	• •
Irrigation Equipment	• •	Labour Force	• •
Water Supply	• • •	Service Conditions	• • •
Approach to Irrigation	• •	Development Actions	• •
Methods and Scheduling	• •	Management Participation	• •
Operation/Maintenance	• • •	Labour Organisation	• •
Design/Installation	• •	Labour Situation	• • •
Annual Water Supply	• • •	Attitude to Legislation	• •
Delivery of Water	• • •	Renumeration	• • •
Irrigation Understanding	• • •	Development Actions	• •
Attitude Water Management	• •	Training Inputs	• •
Irrigation Methods	• • •	Efficiency Contribution	• •
Scheduling Practices	• •	Supervisory Contribution	• •
CROP PROFIT POTENTIAL	• •	**FARMER SITUATION**	• • •
Crop Production	• •	Personal Goals	• •
Crop Income	• • •	Personal Relationships	• • • •
Natural Resources	• • •	Motivation	• •
Crop Production	• •	Attitudes	• • •
Crop Profitability	• •	Personal Reactions	• • • •
Risks	• • •	People Relationships	• • •
Suitability of Climate	• • •	Farm Way of Life	• • •
Suitability of Soils	• • •	Career Stage	• •
Crop Possibilities	• • •	Property Plans	• • •
Crop Yields	• •	Decision-making	• • •
Input Costs	• •	Stress	• • •
Gross Margin Potential	• • •	Personal/Family Aspects	• • • •
Market/Price Risk	• • •	Wife Support	• • •
Production Risk	• • •	Community Involvement	• • •
GENERAL MANAGEMENT	• •	**FINANCIAL ASPECTS**	• • • •
Day-to-day Management	• •	Short Term	• • •
Strategic Management	• •	Long Term	• • • •
Field Management	• •	Financial Admin.	• • •
Office Organisation	• • •	Cash Flow	• • •
Knowledge Base	• • •	Farm Ownership	• • • •
Operational Management	• •	Income Prospects	• • •
Supervisory Support	• •	Accounting Services	• • •
Personal Supervision	• • •	Credit Rating	• • •
Seasonal Planning	• • •	Access to Income	• •
Record Keeping	• • •	Impact of inflation	• • •
Counselling and Advice	• • •	Marketability of Farm	• • •
Training and Experience	• • •	Bond Repayments	• • • •
Management Structures	• • •	Scale of Operation	• • •
Long-term Planning	• •	Income Aspirations	• • •

TABLE: 8.1 - SAPFACT PROFILE NATAL COASTAL AREA - FARMER No 9

IRRIGATION MANAGEMENT	*** * * ***	**LABOUR MANAGEMENT**	*** * * ***
Water Supply & Equipment	* * *	Labour Relations	* * *
Irrigation Know-How	* * * *	Labour Development	* * * *
Irrigation Equipment	* * *	Labour Force	* * *
Water Supply	* * *	Service Conditions	* * *
Approach to Irrigation	* * * *	Development Actions	* * *
Methods and Scheduling	* * * *	Management Participation	* * * *
Operation/Maintenance	* * *	Labour Organisation	* * *
Design/Installation	* * *	Labour Situation	* * *
Annual Water Supply	* * *	Attitude to Legislation	* * *
Delivery of Water	* * *	*Renumeration*	* * *
Irrigation Understanding	* * *	Development Actions	* * *
Attitude Water Management	* * *	Training Inputs	* * *
Irrigation Methods	* * * *	Efficiency Contribution	* * *
Scheduling Practices	* * *	Supervisory Contribution	* * * *
CROP PROFIT POTENTIAL	*** * * ***	**FARMER SITUATION**	*** * * ***
Crop Production	* * *	Personal Goals	* * * *
Crop Income	* * * *	*Personal Relationships*	* * * *
Natural Resources	* * *	Motivation	* * * *
Crop Production	* * *	Attitudes	* * * *
Crop Profitability	* * * *	Personal Reactions	* * * *
Risks	* * *	People Relationships	* * * *
Suitability of Climate	* * *	Farm Way of Life	* * * *
Suitability of Soils	* * *	Career Stage	* * *
Crop Possibilities	* * *	Property Plans	* * *
Crop Yields	* * *	Decision-making	* * * *
Input Costs	* * *	Stress	* * *
Gross Margin Potential	* * * *	Personal/Family Aspects	* * * *
Market/Price Risk	* * *	Wife Support	* * * *
Production Risk	* * *	*Community Involvement*	* * *
GENERAL MANAGEMENT	*** * * ***	**FINANCIAL ASPECTS**	*** * * ***
Day-to-day Management	* * * *	Short Term	* * * *
Strategic Management	* * * *	Long Term	* * * *
Field Management	* * * *	Financial Admin.	* * * *
Office Organisation	* * *	Cash Flow	* * * *
Knowledge Base	* * * *	*Farm Ownership*	* * * *
Operational Management	* * * *	Income Prospects	* * * *
Supervisory Support	* * * *	Accounting Services	* * *
Personal Supervision	* * *	Credit Rating	* * * *
Seasonal Planning	* * *	Access to Income	* * *
Record Keeping	* * *	Impact of inflation	* * * *
Counselling and Advice	* * * *	Marketability of Farm	* * *
Training and Experience	* * *	Bond Repayments	* * * *
Management Structures	* * * *	Scale of Operation	* * * *
Long-term Planning	* * *	Income Aspirations	* * *

TABLE: 8.2 - SAPFACT PROFILE NATAL COASTAL AREA- FARMER No 10

IRRIGATION MANAGEMENT	* *	**LABOUR MANAGEMENT**	* *
Water Supply & Equipment	* * *	Labour Relations	* *
Irrigation Know-How	* *	Labour Development	* *
Irrigation Equipment	* * *	Labour Force	* *
Water Supply	* * *	Service Conditions	* * *
Approach to Irrigation	* * *	Development Actions	* *
Methods and Scheduling	* *	Management Participation	* *
Operation/Maintenance	* * *	Labour Organisation	* *
Design/Installation	* * *	Labour Situation	* * *
Annual Water Supply	* * *	Attitude to Legislation	* * *
Delivery of Water	* * *	Renumeration	* * *
Irrigation Understanding	* * *	Development Actions	* *
Attitude Water Management	* * *	Training Inputs	* *
Irrigation Methods	* * *	Efficiency Contribution	* *
Scheduling Practices	* *	Supervisory Contribution	* *
CROP PROFIT POTENTIAL	* *	**FARMER SITUATION**	* * *
Crop Production	* *	Personal Goals	* * *
Crop Income	* *	Personal Relationships	* * *
Natural Resources	* *	Motivation	* * *
Crop Production	* * *	Attitudes	* * *
Crop Profitability	* *	Personal Reactions	* * *
Risks	* * *	People Relationships	* * *
Suitability of Climate	* * *	Farm Way of Life	* * *
Suitability of Soils	* *	Career Stage	* * *
Crop Possibilities	* * *	Property Plans	* * *
Crop Yields	* * *	Decision-making	* * *
Input Costs	* * *	Stress	* * *
Gross Margin Potential	* *	Personal/Family Aspects	* * *
Market/Price Risk	* * *	Wife Support	* * *
Production Risk	* * *	Community Involvement	* * *
GENERAL MANAGEMENT	* *	**FINANCIAL ASPECTS**	* * *
Day-to-day Management	* *	Short Term	* * *
Strategic Management	* *	Long Term	* * *
Field Management	* *	Financial Admin.	* * *
Office Organisation	* * *	Cash Flow	* * *
Knowledge Base	* *	Farm Ownership	* * * *
Operational Management	* *	Income Prospects	* *
Supervisory Support	* *	Accounting Services	* * *
Personal Supervision	* * *	Credit Rating	* * *
Seasonal Planning	* * *	Access to Income	* * *
Record Keeping	* * *	Impact of inflation	* * *
Counselling and Advice	* * *	Marketability of Farm	* * *
Training and Experience	* *	Bond Repayments	* * * *
Management Structures	* *	Scale of Operation	* *
Long-term Planning	* *	Income Aspirations	* * *

TABLE: 8.3 - SAPFACT PROFILE NATAL COASTAL AREA - FARMER No 11

IRRIGATION MANAGEMENT	* *	**LABOUR MANAGEMENT**	* *
Water Supply & Equipment	* * *	Labour Relations	* *
Irrigation Know-How	* *	Labour Development	* * *
Irrigation Equipment	* * *	Labour Force	* *
Water Supply	* * *	Service Conditions	* *
Approach to Irrigation	* *	Development Actions	* * *
Methods and Scheduling	* *	Management Participation	* * *
Operation/Maintenance	* * *	Labour Organisation	* *
Design/Installation	* * *	Labour Situation	* * *
Annual Water Supply	* * *	Attitude to Legislation	* *
Delivery of Water	* * *	Renumeration	* * *
Irrigation Understanding	* *	Development Actions	* * *
Attitude Water Management	* * *	Training Inputs	* * *
Irrigation Methods	* * *	Efficiency Contribution	* * *
Scheduling Practices	* *	Supervisory Contribution	* * *
CROP PROFIT POTENTIAL	* * * *	**FARMER SITUATION**	* * * *
Crop Production	* * * *	Personal Goals	* * *
Crop Income	* * *	Personal Relationships	* * * *
Natural Resources	* * *	Motivation	* * *
Crop Production	* * * *	Attitudes	* * *
Crop Profitability	* * *	Personal Reactions	* * * *
Risks	* * *	People Relationships	* * * *
Suitability of Climate	* * *	Farm Way of Life	* * *
Suitability of Soils	* * *	Career Stage	* * *
Crop Possibilities	* * * *	Property Plans	* * *
Crop Yields	* * *	Decision-making	* * *
Input Costs	* * *	Stress	* * * *
Gross Margin Potential	* * *	Personal/Family Aspects	* * * *
Market/Price Risk	* * *	Wife Support	* * *
Production Risk	* * *	Community Involvement	* * * *
GENERAL MANAGEMENT	* * * *	**FINANCIAL ASPECTS**	* * * *
Day-to-day Management	* * *	Short Term	* * * *
Strategic Management	* * * *	Long Term	* * * *
Field Management	* * *	Financial Admin.	* * * *
Office Organisation	* * *	Cash Flow	* * * *
Knowledge Base	* * * *	Farm Ownership	* * * *
Operational Management	* * * *	Income Prospects	* * *
Supervisory Support	* * *	Accounting Services	* * *
Personal Supervision	* * *	Credit Rating	* * * *
Seasonal Planning	* * *	Access to Income	* * *
Record Keeping	* * *	Impact of inflation	* * * *
Counselling and Advice	* * * *	Marketability of Farm	* * *
Training and Experience	* * *	Bond Repayments	* * * *
Management Structures	* * * *	Scale of Operation	* * *
Long-term Planning	* * *	Income Aspirations	* * *

TABLE: 8.4 - SAPFACT PROFILE NATAL COASTAL AREA - FARMER No 12

IRRIGATION MANAGEMENT	**	**LABOUR MANAGEMENT**	**
Water Supply & Equipment	**	Labour Relations	***
Irrigation Know-How	**	Labour Development	**
Irrigation Equipment	***	Labour Force	***
Water Supply	**	*Service Conditions*	***
Approach to Irrigation	***	Development Actions	**
Methods and Scheduling	**	Management Participation	**
Operation/Maintenance	***	Labour Organisation	***
Design/Installation	***	Labour Situation	***
Annual Water Supply	**	Attitude to Legislation	***
Delivery of Water	**	Renumeration	***
Irrigation Understanding	***	Development Actions	**
Attitude Water Management	***	Training Inputs	***
Irrigation Methods	***	Efficiency Contribution	***
Scheduling Practices	**	Supervisory Contribution	**
CROP PROFIT POTENTIAL	**	**FARMER SITUATION**	***
Crop Production	**	Personal Goals	***
Crop Income	***	*Personal Relationships*	***
Natural Resources	***	Motivation	**
Crop Production	**	Attitudes	****
Crop Profitability	***	Personal Reactions	***
Risks	***	People Relationships	***
Suitability of Climate	***	Farm Way of Life	***
Suitability of Soils	***	Career Stage	**
Crop Possibilities	***	Property Plans	****
Crop Yields	**	Decision-making	***
Input Costs	**	*Stress*	***
Gross Margin Potential	****	Personal/Family Aspects	***
Market/Price Risk	***	Wife Support	***
Production Risk	***	Community Involvement	***
GENERAL MANAGEMENT	**	**FINANCIAL ASPECTS**	***
Day-to-day Management	**	Short Term	***
Strategic Management	***	Long Term	***
Field Management	**	Financial Admin.	***
Office Organisation	***	Cash Flow	***
Knowledge Base	***	Farm Ownership	****
Operational Management	**	Income Prospects	**
Supervisory Support	**	Accounting Services	***
Personal Supervision	***	Credit Rating	***
Seasonal Planning	***	Access to Income	***
Record Keeping	***	Impact of inflation	***
Counselling and Advice	***	Marketability of Farm	***
Training and Experience	***	Bond Repayments	****
Management Structures	**	Scale of Operation	**
Long-term Planning	***	Income Aspirations	***

TABLE: 8.5 - SAPFACT PROFILE NATAL COASTAL AREA - FARMER No 13

IRRIGATION MANAGEMENT	• •	**LABOUR MANAGEMENT**	• •
Water Supply & Equipment	• • •	Labour Relations	• • •
Irrigation Know-How	• •	Labour Development	• •
Irrigation Equipment	• • •	Labour Force	• • •
Water Supply	• • •	Service Conditions	• • •
Approach to Irrigation	• •	Development Actions	• • •
Methods and Scheduling	• •	Management Participation	• •
Operation/Maintenance	• • •	Labour Organisation	• • •
Design/Installation	• • •	Labour Situation	• • •
Annual Water Supply	• • •	Attitude to Legislation	• • •
Delivery of Water	• • •	Renumeration	• • •
Irrigation Understanding	• •	Development Actions	• • •
Attitude Water Management	• • •	Training Inputs	• • •
Irrigation Methods	• • •	Efficiency Contribution	• • •
Scheduling Practices	• •	Supervisory Contribution	• •
CROP PROFIT POTENTIAL	• •	**FARMER SITUATION**	• • • •
Crop Production	• • •	Personal Goals	• • • •
Crop Income	• •	Personal Relationships	• • •
Natural Resources	• • •	Motivation	• • •
Crop Production	• • •	Attitudes	• • • •
Crop Profitability	• •	Personal Reactions	• • •
Risks	• • •	People Relationships	• • •
Suitability of Climate	• • •	Farm Way of Life	• • •
Suitability of Soils	• • •	Career Stage	• • •
Crop Possibilities	• • •	Property Plans	• • •
Crop Yields	• • •	Decision-making	• • • •
Input Costs	• •	Stress	• • •
Gross Margin Potential	• • •	Personal/Family Aspects	• • •
Market/Price Risk	• • •	Wife Support	• • •
Production Risk	• • •	Community Involvement	• • •
GENERAL MANAGEMENT	• • •	**FINANCIAL ASPECTS**	• • • •
Day-to-day Management	• • •	Short Term	• • • •
Strategic Management	• • •	Long Term	• • •
Field Management	• • •	Financial Admin.	• • •
Office Organisation	• • •	Cash Flow	• • • •
Knowledge Base	• • • •	Farm Ownership	• • • •
Operational Management	• •	Income Prospects	• •
Supervisory Support	• • •	Accounting Services	• • •
Personal Supervision	• • •	Credit Rating	• • •
Seasonal Planning	• • •	Access to Income	• • •
Record Keeping	• • •	Impact of inflation	• • • •
Counselling and Advice	• • •	Marketability of Farm	• • •
Training and Experience	• • •	Bond Repayments	• • • •
Management Structures	• • •	Scale of Operation	• •
Long-term Planning	• •	Income Aspirations	• • •

TABLE: 8.6 - SAPFACT PROFILE NATAL COASTAL AREA - FARMER No 14

CHAPTER 9

TRANSVAAL IRRIGATION AREAS

9.1 GENERAL

It is not always appreciated that the Transvaal is a very important irrigation area, with 260 000 hectares under irrigation. The main irrigation areas at the time of the study were the Western Transvaal (irrigation area 37 000 hectares, mainly from the Hartebeestpoort and associated dams), Northen Transvaal (irrigation area 41 000 hectares, much of the water from privately operated boreholes), Central Transvaal (irrigation area 40 000 hectare, mainly from the Loskop dam) and the Lowveld (irrigation area 138 000 hectares with the bulk of the water being provided by Irrigation Boards from rivers).

No farmers were interviewed in the Lowveld, the interviews being confined to the other three areas. It will be appreciated that the sample was insignificant, but this is a pilot project to assess the approaches adopted, and not an investigation into irrigation in South Africa. What is surprising, however, is the degree to which even these few scattered interviews were able to provide insights into the "character" of irrigation farming in the area. This is one of the applications of qualitative research.

Irrigation in the areas outside of the Lowveld is influenced by periodic shortfalls in water supply from the main irrigation dams, supplementary irrigation of summer crops and proximity to important population centres.

9.2 IRRIGATION MANAGEMENT ASPECT, TRANSVAAL IRRIGATION AREAS

Soils and climate vary widely in this area and the eight farms discussed represent only a small part of the whole. The conditions during winter, when wheat is the main crop, are typical of the rest of the country, with the exception of the Western and Eastern Cape. Winter atmospheric demand does not vary much within the area. The position in summer is different in that precipitation is an important and variable factor. This is of particular significance because irrigation schemes were designed and managed to provide for the winter irrigation period, on the assumption that rain would provide for most of the needs of summer crops. Deciding on the "share" of available water to be allocated to the summer crop is not easy.

In the case of state water schemes and irrigation boards, water is sourced from dams such as Loskop and Hartebeespoort. Supply is subject to the vagaries of quotas imposed in drought periods (when irrigation requirements peak) and to the water delivery regimes in force. Adequate water, when needed, can never be taken for granted, and this inhibits farmer willingness to invest time and energy in irrigation management.

Private farm irrigation systems are usually dependent on underground water sources, only too easilly depleted in times of drought. Possibly the best arrangement is where scheme water is augmented by underground water, allowing the farmer greater freedom of action.

The classic irrigation progression from flood to sprinkler and then on to pivots or micro or drip is applicable, but there are still examples of all systems in operation. The picture is a depressing one for irrigation specialists and scientists. Equipment is, as a general rule, poorly maintained, there is little real understanding of the principles of irrigation, and equipment and operating procedures are rarely checked or calibrated. Nevertheless, there are outstanding exceptions, clearly identified in the SAPFACT rankings.

9.2.1 *Equipment Operation and Maintenance*: Equipment received little attention until a breakdown occured, and pump pressures and sprinkler delivery were rarely checked. There was a reluctance to invest in replacing worn pivot sprinkler nozzles so that over-irrigation was almost inevitable. In an emergency, farmers are well served by equipment suppliers in adjacent towns. While the top farmers were well in the picture on equipment operation, many left the detail to relatively untrained labour.

9.2.2 Equipment Design and Installation: The irrigation industry is now very experienced and backed by the testing facilities of the Directorate of Irrigation Engineering. The specification and selection of equipment presents few difficulties and installation was generally satisfactory. There were, however, indications that more attention should be given to agronomic and soil aspects when designing systems.

9.2.3 *Annual Water Supply*: A problem faced by farmers is the uncertainty as to how much water will be available in any one season. The recent droughts showed that it is all very well to suggest that irrigation management should be improved, and the best use made of available water, but achieving this can become a nightmare. The bigger farmers can cut back production to suit water availability and still service debts and normal obligations, but the smaller the turnover, the more difficult this becomes. Uncertain water supplies impose serious difficulties for a counsellor or equipment supplier. This suggests that it is not realistic to over-emphasisise improved farmer efficiency under these circumstances?

9.2.4 **Water Delivery**: Transvaal schemes were originally geared to flood irrigation so water is ordered on a weekly basis. This is not appropriate for pivot, micro and drip irrigation. There is usually a limit on how much can be delivered to a farmer at a time so that, should a "turn be missed", it is virtually impossible to "catch up" subsequently. In the cases where water is released into a river and pumped by individual farmers, buffer reservoirs must be constructed to even out the supply to the lands. Irregular water delivery makes a mockery of "real time" scheduling.

9.2.5 Understanding of Irrigation: Atmospheric demand in summer is not as high as it is in the more arid parts of the country, which reduces the dangers of "falling behind". At the same time, the effect of rain must be taken into consideration if over-irrigation and deep percolation is to be avoided. To irrigate effectively, a farmer, or his people, must have a clear understanding of

soil/water/plant relationships and of elementary monitoring procedures. Too many of the elite farmers interviewed lacked this understanding, and it can be assumed that an even greater proportion of "run of the mill" farmers fail to grasp what is happening below the surface of the soil.

9.2.6 Attitude to Water Management: The farmers appreciated that water was a scarce resource, but their response is directed more to the acquisition of additional water by buying land with water rights, than it is to making more efficient use of available water. Economically and practically, the former makes better sense.

9.2.7 Irrigation Methods: Most of the farmers interviewed had progressed to pivots for field crops and micro for orchards. Hand-move sprinkler lines were still in use for vegetables and pastures. Interestingly enough, one Loskop farmer had installed drip for cotton, with good results, but had found the method to be too management-intensive.

9.2.8 Scheduling Practices: The most common practice mentioned for field crops, vegetables and orchards was the direct measurement of soil water by means of tensiometers. Most farmers who had used them said they had done so for a year or two "until they had got the feel of things". Two of the farmers, both very well versed in irrigation principles, had used the A-pan in conjunction with tensiometers to calibrate crop factors which they applied successfully to real-time scheduling based on profit-and-loss water balances. The bulk of the farmers did not schedule but relied on experience and visual observation. The yields of wheat in the Brits area had been dramatically improved by the introduction of pre-programmed irrigation similar to the BEWAB procedure, showing that the main error in unscheduled irrigation was not so much the total quantity of water applied, but rather the seasonal distribution of the water.

9.3 CROP PROFIT POTENTIAL ASPECT, TRANSVAAL IRRIGATION AREAS

The staple crops in the Loskop area were wheat, tobacco, cotton, groundnuts, citrus and contract vegetables for processing. The crops in the Brits area were similar but cotton was less prominent and the vegetables were largely for the PWV fresh produce markets. The crop profit potential has been drastically reduced by the increased cost of inputs, particularly for the field crops, and by the severe drop in the price of cotton and tobacco. Wheat remains profitable, provided yields of 6 ton per hectare can be achieved, which is possible but not easy.

9.3.1 Suitability of Climate: The climate is appropriate for the crops being produced in the respective areas. Frost can, however, limit crop growing seasons and the distribution of permanent crops. Summers are hot but evaporative demand is moderate due to cloud cover, reasonable humidity and very little wind.

9.3.2 Suitability of Soils: Irrigated soils vary widely, but are generally adequate. Soils with a high clay content tend to be the "difficult" irrigation soils and require specialised techniques, particularly if drip irrigation is applied to crops such as tobacco. Infiltration is influenced by clay mineorology and can be very limited. However, pivot irrigation applications in excess of 25 mm are normally

possible, eliminating the need for very short cycle times.

9.3.3 **Crop Possibilities:** With the possible exception of wheat, it appears that the days of the field crops, on which irrigation farming in this area was built, are numbered. The major issues facing farmers centre on what to grow in the future. Economic circumstances demand the highest possible gross margins, in the order of R10 000 per hectare, rather than the R1 500 of field crops. There is no one answer to this requirement. Permanent crops with an export potential, really only citrus in this area, are the ideal. An interim solution is the production, under contract to large food processors, of crops such as beans, peas, sweetcorn, pop corn, tomatos and potatoes but this is a limited market. The production of seed under contract also has a limited market.

Vegetables are an important crop whether marketed through the fresh product markets or attractively packaged through the chain stores. There are large producers in this area; 50 hectare of onions growing under a single pivot is not uncommon, but vegetables are high risk, with gluts being only too common.

No one can predict the future, but the miracles of genetic engineering will probably shape the future of this irrigation area, so conveniently placed near the PWV.

9.3.4 **Crop Yields:** Yields varied, but the impression was that they tended to be somewhat lower than those achieved in other areas of the country.

9.3.5 **Production Costs:** No out of the ordinary factors were identified. The area has the advantage of developed infrastructures but proximity to industrial areas could raise wages.

9.3.6 **Gross Margin Potential:** The successful farmers in this area have, over time, purchased additional holdings and expanded production and water rights. It seems likely that survival in the future will be directed towards vertical expansion and more effective irrigation management.

9.3.7 **Market / Price Risk:** As discussed in paragraph 9.3.3 vegetable production for the markets involves high risk. On the other hand, farmers co-operatively juicing citrus seem to have established a very safe enterprise. What became obvious was that the question of what to grow, and for whom, needs to be established before any planning can be undertaken with confidence.

9.3.8 **Production Risk:** The main dangers are water shortages, untimely frost and hail but, generally, this is an area with fewer hazards than most!

9.4 GENERAL MANAGEMENT ASPECT, TRANSVAAL IRRIGATION AREAS

The farms in this area were labour-intensive which emphasised supervision. Few farmers had support in this function which meant that much depended on personal properties. Drought, rising input costs and new pricing policies placed considerable demands on farmer's management ability.

9.4.1 **Supervisory Support:** Although the labour intensive farming placed a premium on good supervision, in most cases, the farmer had only limited support in the form of senior labourers acting as foreman. There was one notable exception, where a farmer, concentrating on the production of seed, and employing up to 150 labourers, had developed a pro-active management team.

9.4.2 **Personal Supervision:** In the absence of effective support, the success of the enterprise depended on the farmer's personal dedication and ability. This is a serious vulnerability, and could have an adverse influence on the efficiency of irrigation management.

9.4.3 **Seasonal Planning:** Many farmers in the area were going through a period of change, which meant that planning for the next season was no routine matter. There was no certainty about water supplies or crop prices. Farmers with an assured ground water supply and established products such as citrus for juice, seed or vegetables on contract, or wheat, were facing a routine planning exercise, but they were the exceptions. The others were facing an almost impossible task.

9.4.4 **Record-Keeping:** It is doubted if many of the farmers kept more than the essential financial and labour records. Sound information on all farming activities would be valuable as a planning base, in the case of farmers facing difficult alternatives.

9.4.5 *Counselling and Advice: The degree to which farmers sought and utilised advice varied* considerably. It was noticeable that the best- organised farmers made extensive use of professional and technical advice. This was especially the case with some of the citrus farmers, who relied on the then Citrus and Sub-Tropical Fruit Research Institute at Nelspruit for guidance. A culture of close co-operation had been built up amongst tobacco farmers at Brits, with considerable professional input, but, amongst vegetable growers, it was every man for himself, with technical secrets being closely guarded. Co-operatives were an important link in the advisory chain but there were complaints that many farmers were reluctant to seek advice, possibly because it could disclose their apparent "ignorance". Local suppliers were the source of information on technical aspects of equipment operation and selection.

9.4.6 **Training and Experience:** Nearly all the farmers interviewed had grown up on farms, some on their present farms. Two had agricultural college diplomas, another had had to leave university when his father's health failed, and one had matriculated at an agricultural high school, so that they had a sound background for farming. It was interesting that several of them had spent a period away from the farm, either in business or teaching, and believed that the experience had been of great value in their farming careers.

9.4.7 **Management Structures:** Not all the farms were one-man-bands. One had a complete corporate structure, while, on another, long-service employees had been developed into a pro-active management team.

9.4.8 **Long-Term Planning:** Long-term planning does not come easily to farmers. It was noticeable

that there were farmers who were finding it difficult to appreciate that the pattern of the past two decades had undergone drastic change. They had built up their farms by working hard and doing the right things, but this was no longer good enough. Long-term planning to one farmer was identifying a crop in the rotation that would allow "uintjie" control, when it should have meant a frantic search for a crop, or new enterprise, that would keep him in business.

9.5 LABOUR MANAGEMENT ASPECT, TRANSVAAL IRRIGATION AREA

Labour was important on the farms visited. Farms with about 120 hectares under irrigation employed in the order of 30 people, half permanent. A 200 hectares operation concentrating on seed production employed about 100 permanent people and 50 seasonally, while a similar sized farm producing field crops had a complement of 70, enough people for a small factory, and just one man to supervise it all. It is no wonder that people tend to be seen in group, or "span" context, and not as individuals. Irrigation is precision farming and the people can become assets if their full potential can be developed.

9.5.1 Labour Organisation: At the time of the interviews, the internal organisations on the farm were "traditional" with little evidence of worker committees. There were exceptions, where formal contracts were entered into, but, on most farms, the relationship appeared to be unstructured.

9.5.2 Labour Situation: The farmers considered the position to be satisfactory. Labour was available.

9.5.3 Attitude to Legislation: The farmers were tentative at the time, as they did not know what to expect. There was concern over the possibilities of big hikes in wages and this concern is understandable in the light of the large number of people employed! The future may see a drastic revision in employment policies.

9.5.4 Remuneration: There were complaints that farmers could not compete with the wages paid by Water Affairs and industrial concerns so it can be assumed that remuneration was still according to traditional norms.

9.5.5 Development Actions: One farmer had embarked on a pioneering approach to developing his people and changing their role on the farm. The results have been impressive. The Rural Foundation has done much to promote development of people on the farms but, on the whole, little action had been taken on the farms visited.

9.5.6 Training Inputs: Significant progress was evident, with Boskop Training Centre, the co-operatives and commercial organisations involved. Unfortunately, training in irrigation has lagged.

9.5.7 Efficiency Contribution: Does the labour contribute to more efficient irrigation? The answer

is obviously affirmative but this varies from farm to farm.

9.5.8 Supervisory Contribution: Much has been said about the development of the people on the farm to the extent that they make a positive contribution to management and supervision. This approach appeared to be in its early days in this area.

9.6 FARMER SUCCESS POTENTIAL ASPECT, TRANSVAAL IRRIGATION AREAS

The Transvaal was the major irrigation area in the RSA and the irrigation farmers interviewed came from widely differing backgrounds and faced very different circumstances. It was not possible to generalise. This, in itself, stresses how important it is to consider individual farmers and communities when developing policies and strategies.

9.6.1 Farm Way of Life: At the time of the survey, drought, irrigation water shortages, high interest rates, crime and a depressed market for farms were nagging worries and many farmers in the Transvaal found it difficult to remain optimistic. Farm life was starting to pall. Most have, however, found ways of staying in business.

9.6.2 Career Stage: Optimism and innovation were not limited to the young, there were farmers in their 60's running dynamic enterprises. Conditions were, however, difficult for some of the farmers who wished to retire and could not find a purchaser for the farm. The position was even worse when both father and son lost confidence in farming as a career.

9.6.3 Property Plans: As in the other areas of the country, there was little sign of the aggressive horizontal expansion of farms through the purchase of adjoining properties, which was the conventional route only a few years ago. The slow market discouraged farm sales and farmers seemed to be looking to consolidation and vertical expansion through more intensive land utilisation and higher yields.

9.6.4 Decision-Making: Many farmers were finding it difficult to define their problems. Some farmers seemed to have grasped the significance of declining gross margins for field crops and had systematically acquired the data and advice that resulted in sound decisions on alternative action. Unfortunately they were in the minority. There was a tendency to link decision-making to the day-to-day ad hoc selection of one or two viable options.

9.6.5 Stress: The survey was undertaken at an anxious time when all farmers, including irrigation farmers, in the Transvaal were under pressure brought about by drought conditions and financial constraints. With the exception of a few well-established farmers producing specialist crops, the farmers interviewed showed signs of stress.

9.6.6 **Personal / Family Aspects:** This is obviously a link in the chain that can contribute to success or failure but it can only be assessed in the context of the individual.

9.6.7 **Support Given by Wife:** Only one of the wives on the farms visited held herself aloof from the farming enterprise, while three were very much involved. On two of the smaller farms, this was mainly taking full responsibility for record-keeping and much of the purchasing, while on a large enterprise the wife had executive responsibility for administration, despite the employment of full-time clerical staff. The additional unit in the management team can be a decisive factor in achieving efficiency and success.

9.6.8 **Community Involvement:** Institutions such as the co-operatives, study groups and farmers' associations played an important part in the Transvaal and even political alliances had an influence on the farm business. It was understandable that the more successful farmers were active in these circles.

9.7 FINANCIAL ASPECTS, TRANSVAAL IRRIGATION AREAS

In the Transvaal areas visited, where the main enterprises had been field crops, vegetables and citrus, an essential element in survival had been the identification, introduction, production and marketing of "new" profitable products. Generally, production methods are-labour intensive but it is doubted if this will be sustainable in a future where labour legislation and trade union activities will play an important role.

9.7.1 **Accounting Services:** In all the areas visited, the co-operatives and private agencies provided sound computerised accounting facilities. There were examples of farms where modern management accounting techniques were utilised.

9.7.2 **Credit Rating:** No quantitative information was sought but the impression was that the farmers interviewed had not had problems with obtaining credit. In most cases, they relied on co-operatives for production loans and went to commercial sources for medium-term credit. They had had access to Land Bank loans when purchasing properties. Two of the successful farmers stressed that they had always adopted an ultra-conservative policy and had opted for "own" capital when at all possible.

9.7.3 **Access to Income:** As is to be expected in areas adjacent to the main business and manufacturing areas of the Transvaal, "off-farm" income had played a part in establishing or expanding some of the farms. This was limited to the salaries earned by the farmer himself or a family member. There were examples of people working as teachers or in businesses, while getting established on new or old family properties. At the time of the survey, this was no longer a factor as the farmers visited were past this stage. The size of the enterprise, and the value of the products, had an influence on available income and it is known from the Sondeo survey done in the Brits area that there are small farms in that area where income is inadequate.

9.7.4 **Impact of Inflation:** In common with the other areas investigated the bulk of the farmers interviewed had acquired their core farms and equipment in the era of relatively low inflation and interest rates. This had helped them to withstand the economic pressures that had put their less *fortunate neighbours out of business.*

9.7.5 **Marketability of Farm:** The market for irrigation farms in the Transvaal has been depressed as a consequence of economic conditions and cuts in water supplies as a result of the drought. The future assurance of water supplies is important if irrigation farms are to retain their value.

9.7.6 **Bond Repayment:** See paragraph 9.7.4; the bulk of the farmers interviewed had either cleared their bonds or were making relatively insignificant payments.

9.7.7 **Scale of Operation:** See paragraph 9.7.3; the farms visited during the open-ended interview survey were large enough to provide a reasonable income even in times of drought.

9.7.8 **Income Aspirations:** Generally, these were modest; there were no real examples of large "flashy" estates, although several of the families were living well. One farmer had no reservations: his aspiration was to ensure that he had cleared all his debts on his farm by the time he was 45 so that he could go into semi-retirement. This remark illustrates the tenet that farmers aspire to meet living expenses, including a new vehicle and a holiday now and then, and to provide for the security of the farm.

9.8 INDIVIDUAL FARMER RANKINGS, TRANSVAAL IRRIGATION AREAS

9.8.1 Farmer No 15 (see Table 9.1)

A farm with 450 hectares under irrigation, largely pivots, with water from the Rooikoppies dam near Brits being pumped from the river. The main crops were wheat and vegetables. Moderate yields, *largely as a consequence of indifferent irrigation management, were putting pressure on profits.* Exposure to "counselling" and improvements in irrigation management had resulted in yield improvements. The management load on a farm of this size, producing both field and vegetable crops and employing over 100 people (permanent and seasonal) is considerable. The upgrading of technical irrigation factors in isololation would be counter-productive, the farmer needs management support.

IRRIGATION MANAGEMENT	* *	LABOUR MANAGEMENT	* *
CROP PROFIT POTENTIAL	* *	FARMER SITUATION	*
GENERAL MANAGEMENT	*	FINANCIAL ASPECTS	* *

9.8.2 Farmer No 16 (see Table 9.2)

This farm specialised in producing citrus for juicing under irrigation. The orchards were 120 hectares in extent, with the water being sourced from a series of boreholes and from a dam built by a small irrigation board. In common with some of his neighbours, he had grown up on a farm in the area, gone into business and returned when the opportunity offered. This particular farmer had applied all his business and management experience in his farming venture. This was particularly evident in the way in which he obtained and applied technical information and set about both short- and long-term planning.

IRRIGATION MANAGEMENT	* * * *	LABOUR MANAGEMENT	* * *
CROP PROFIT POTENTIAL	* * * *	FARMER SITUATION	* * * *
GENERAL MANAGEMENT	* * * *	FINANCIAL ASPECTS	* * * *

9.8.3 Farmer No 17 (see Table 9.3)

A small mixed irrigation farm, which produced citrus for juicing on the higher-lying better soils, using borehole water. Vegetables were produced on the heavier soils which were served by an irrigation board canal.

IRRIGATION MANAGEMENT	* *	LABOUR MANAGEMENT	* *
CROP PROFIT POTENTIAL	* *	FARMER SITUATION	* *
GENERAL MANAGEMENT	* *	FINANCIAL ASPECTS	* *

9.8.4 Farmer No 18 (see Table 9.4)

This large specialised potato farm has been in the family for three generations. Ground water has been conservatively managed. Potatoes were augmentmented by cattle produced on grazing which is part of the crop rotation. Irrigation was by pivots scheduled by A-pan with the objective of controlling the water so as to ensure optimum quality. The farm was run on business lines with a structured management and comprehensive transport, production and marketing infrastructure. It is probable that further "fine tuning" by an irrigation specialist could be beneficial.

IRRIGATION MANAGEMENT	* * * *	LABOUR MANAGEMENT	* * * *
CROP PROFIT POTENTIAL	* * * *	FARMER SITUATION	* * * *
GENERAL MANAGEMENT	* * * *	FINANCIAL ASPECTS	* * * *

9.8.5 Farmer No 19 (see Table 9.5)

This farmer proved to be an irrigation specialist producing seed maize as the main crop. He had developed "real time" scheduling to a fine art utilising the A-pan and tensiometer to develop crop factors specifically applicable to his crop and cultivation practices. He claimed to have optimised fertiliser use, increased production and reduced irrigation requirements through careful management.

There can be no doubt that he had demonstrated what can be achieved by effective irrigation management. It was not possible to assess the impact of this concentration on irrigation on the profitability of the enterprise as a whole. The competition for scarce management resources is always a danger.

IRRIGATION MANAGEMENT	* * * *	LABOUR MANAGEMENT	* *
CROP PROFIT POTENTIAL	* * *	FARMER SITUATION	* * *
GENERAL MANAGEMENT	* * *	FINANCIAL ASPECTS	* *

9.8.6 Farmer No 20 (see Table 9.6)

This farmer is an entrepreneur. Moving with the times production has been switched from crops traditional to the area to seed production backed-up by wheat. Seed production is labour intensive, and there were 95 permanent and 50 seasonal employees. The development of the employees, and the application of participative management approaches was exceptional.

IRRIGATION MANAGEMENT	* * *	LABOUR MANAGEMENT	* * * *
CROP PROFIT POTENTIAL	* * * *	FARMER SITUATION	* * * *
GENERAL MANAGEMENT	* * * *	FINANCIAL ASPECTS	* * * *

9.8.7 Farmer No 21 (see Table 9.7)

This farmer has geared his activities to the production of field crops requiring modest labour inputs. Declining product prices and rising costs have put him under pressure. He would probably sell if he could command a reasonable price.

IRRIGATION MANAGEMENT	* *	LABOUR MANAGEMENT	*
CROP PROFIT POTENTIAL	* * *	FARMER SITUATION	* *
GENERAL MANAGEMENT	* *	FINANCIAL ASPECTS	* *

9.8.8 Farmer No 22 (see Table 9.8)

Here we have an example of a farmer who had been very successful but was having difficulty in adjusting to changing circumstances. Hard work and dedication were no longer enough to ensure continued success. New crops had to be found, and the yields of traditional crops boosted. This was difficult to achieve with available back-up because the success of the farm was almost totally dependent on the supervision of the farmer, with very little help. He would undoubtedly benefit from experienced counselling and this is what it is anticipated will happen.

IRRIGATION MANAGEMENT	* *	LABOUR MANAGEMENT	* *
CROP PROFIT POTENTIAL	* *	FARMER SITUATION	* *
GENERAL MANAGEMENT	* *	FINANCIAL ASPECTS	* *

9.9 COMPARATIVE RANKINGS

The comparative SAPFACT rankings of five of the farmers discussed is summarised in Figure 9.1.

This is followed by Tables 9.1 - 8 containing the detailed SAPFACT rankings of the farmers discussed in paragraphs 9.8.1 - 9.8.8.

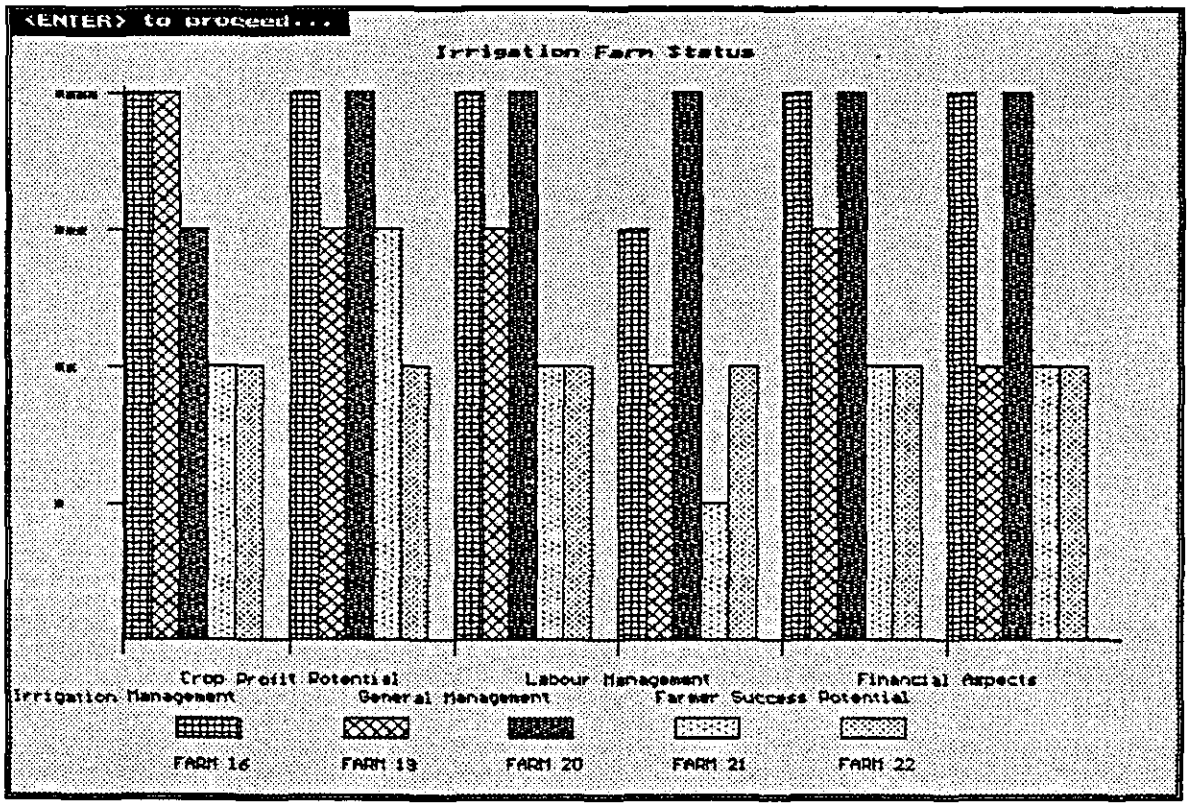

FIGURE: 9.1 SAPFACT RANKINGS TRANSVAAL IRRIGATION AREAS

IRRIGATION MANAGEMENT	**	**LABOUR MANAGEMENT**	**
Water Supply & Equipment	**	Labour Relations	**
Irrigation Know-How	**	Labour Development	**
Irrigation Equipment	**	Labour Force	**
Water Supply	**	Service Conditions	**
Approach to Irrigation	**	Development Actions	**
Methods and Scheduling	**	Management Participation	**
Operation/Maintenance	**	Labour Organisation	*
Design/Installation	***	Labour Situation	***
Annual Water Supply	***	Attitude to Legislation	**
Delivery of Water	**	Renumeration	***
Irrigation Understanding	**	Development Actions	**
Attitude Water Management	**	Training Inputs	**
Irrigation Methods	***	Efficiency Contribution	**
Scheduling Practices	**	Supervisory Contribution	**
CROP PROFIT POTENTIAL	**	**FARMER SITUATION**	*
Crop Production	**	Personal Goals	*
Crop Income	***	Personal Relationships	**
Natural Resources	***	Motivation	**
Crop Production	**	Attitudes	*
Crop Profitability	****	Personal Reactions	**
Risks	**	People Relationships	***
Suitability of Climate	***	Farm Way of Life	***
Suitability of Soils	***	Career Stage	**
Crop Possibilities	***	Property Plans	*
Crop Yields	**	Decision-making	**
Input Costs	***	Stress	**
Gross Margin Potential	****	Personal/Family Aspects	***
Market/Price Risk	**	Wife Support	***
Production Risk	***	Community Involvement	***
GENERAL MANAGEMENT	*	**FINANCIAL ASPECTS**	**
Day-to-day Management	**	Short Term	**
Strategic Management	*	*Long Term*	**
Field Management	**	Financial Admin.	**
Office Organisation	**	Cash Flow	**
Knowledge Base	**	Farm Ownership	**
Operational Management	*	Income Prospects	****
Supervisory Support	*	Accounting Services	***
Personal Supervision	***	Credit Rating	**
Seasonal Planning	**	Access to Income	**
Record Keeping	***	Impact of inflation	***
Counselling and Advice	***	Marketability of Farm	**
Training and Experience	**	Bond Repayments	**
Management Structures	*	Scale of Operation	****
Long-term Planning	**	Income Aspirations	***

TABLE: 9.1 - SAPFACT PROFILE TRANSVAAL IRRIGATION AREA - FARMER No 15

IRRIGATION MANAGEMENT	* *	**LABOUR MANAGEMENT**	* *
Water Supply & Equipment	* *	Labour Relations	* *
Irrigation Know-How	* *	Labour Development	* *
Irrigation Equipment	* *	Labour Force	* *
Water Supply	* *	Service Conditions	* *
Approach to Irrigation	* *	Development Actions	* *
Methods and Scheduling	* *	Management Participation	* *
Operation/Maintenance	* *	Labour Organisation	*
Design/Installation	* * *	Labour Situation	* * *
Annual Water Supply	* * *	Attitude to Legislation	* *
Delivery of Water	* *	Renumeration	* * *
Irrigation Understanding	* *	Development Actions	* *
Attitude Water Management	* *	Training Inputs	* *
Irrigation Methods	* * *	Efficiency Contribution	* *
Scheduling Practices	* *	Supervisory Contribution	* *
CROP PROFIT POTENTIAL	* *	**FARMER SITUATION**	*
Crop Production	* *	Personal Goals	*
Crop Income	* * *	Personal Relationships	* *
Natural Resources	* * *	Motivation	* *
Crop Production	* *	Attitudes	*
Crop Profitability	* * * *	Personal Reactions	* *
Risks	* *	People Relationships	* * *
Suitability of Climate	* * *	Farm Way of Life	* * *
Suitability of Soils	* * *	Career Stage	* *
Crop Possibilities	* * *	Property Plans	*
Crop Yields	* *	Decision-making	* *
Input Costs	* * *	Stress	* *
Gross Margin Potential	* * *	Personal/Family Aspects	* * *
Market/Price Risk	* *	Wife Support	* * *
Production Risk	* * *	Community Involvement	* * *
GENERAL MANAGEMENT	*	**FINANCIAL ASPECTS**	* *
Day-to-day Management	* *	Short Term	* *
Strategic Management	*	Long Term	* *
Field Management	* *	Financial Admin.	* *
Office Organisation	* *	Cash Flow	* *
Knowledge Base	* *	Farm Ownership	* *
Operational Management	*	Income Prospects	* * * *
Supervisory Support	*	Accounting Services	* * *
Personal Supervision	* * *	Credit Rating	* *
Seasonal Planning	* *	Access to Income	* *
Record Keeping	* * *	Impact of inflation	* * *
Counselling and Advice	* * *	Marketability of Farm	* *
Training and Experience	* *	Bond Repayments	* *
Management Structures	*	Scale of Operation	* * * *
Long-term Planning	* *	Income Aspirations	* * *

TABLE: 9.2 - SAPFACT PROFILE TRANSVAAL IRRIGATION AREA - FARMER No 16

IRRIGATION MANAGEMENT	* *	**LABOUR MANAGEMENT**	* *
Water Supply & Equipment	* *	Labour Relations	* *
Irrigation Know-How	* *	Labour Development	* *
Irrigation Equipment	* * *	Labour Force	* *
Water Supply	* *	Service Conditions	* * *
Approach to Irrigation	* *	Development Actions	* *
Methods and Scheduling	* *	Management Participation	* *
Operation/Maintenance	* * *	Labour Organisation	* *
Design/Installation	* * *	Labour Situation	* * *
Annual Water Supply	* *	Attitude to Legislation	* * *
Delivery of Water	* * *	Renumeration	* * *
Irrigation Understanding	* *	Development Actions	* *
Attitude Water Management	* * *	Training Inputs	* *
Irrigation Methods	* * *	Efficiency Contribution	* *
Scheduling Practices	* *	Supervisory Contribution	* *
CROP PROFIT POTENTIAL	* *	**FARMER SITUATION**	* *
Crop Production	* * *	Personal Goals	* *
Crop Income	* *	Personal Relationships	* *
Natural Resources	* * *	Motivation	* *
Crop Production	* * *	Attitudes	* *
Crop Profitability	* *	Personal Reactions	* *
Risks	* * *	People Relationships	* * *
Suitability of Climate	* * *	Farm Way of Life	* * *
Suitability of Soils	* * *	Career Stage	* *
Crop Possibilities	* * *	Property Plans	* * *
Crop Yields	* * *	Decision-making	* *
Input Costs	* * *	Stress	* *
Gross Margin Potential	* *	Personal/Family Aspects	* * *
Market/Price Risk	* * *	Wife Support	* * *
Production Risk	* * *	Community Involvement	* * *
GENERAL MANAGEMENT	* *	**FINANCIAL ASPECTS**	* *
Day-to-day Management	* *	Short Term	* *
Strategic Management	* *	Long Term	* *
Field Management	* *	Financial Admin.	* * *
Office Organisation	* * *	Cash Flow	* *
Knowledge Base	* *	Farm Ownership	* *
Operational Management	* *	Income Prospects	* *
Supervisory Support	*	Accounting Services	* * *
Personal Supervision	* * *	Credit Rating	* * *
Seasonal Planning	* * *	Access to Income	* *
Record Keeping	* * *	Impact of inflation	* * *
Counselling and Advice	* * *	Marketability of Farm	* * *
Training and Experience	* *	Bond Repayments	* *
Management Structures	* *	Scale of Operation	* *
Long-term Planning	* *	Income Aspirations	* * *

TABLE: 9.3 - SAPFACT PROFILE TRANSVAAL IRRIGATION AREA - FARMER No 17

IRRIGATION MANAGEMENT	****		**LABOUR MANAGEMENT**	****	
Water Supply & Equipment	****		Labour Relations	***	
Irrigation Know-How	****		Labour Development	****	
Irrigation Equipment	***		Labour Force	***	
Water Supply	****		Service Conditions	***	
Approach to Irrigation	****		Development Actions	****	
Methods and Scheduling	****		*Management Participation*	***	
Operation/Maintenance	***		Labour Organisation	***	
Design/Installation	***		*Labour Situation*	***	
Annual Water Supply	***		Attitude to Legislation	***	
Delivery of Water	****		Renumeration	***	
Irrigation Understanding	***		Development Actions	****	
Attitude Water Management	***		Training Inputs	***	
Irrigation Methods	***		Efficiency Contribution	***	
Scheduling Practices	***		Supervisory Contribution	***	
CROP PROFIT POTENTIAL	***		**FARMER SITUATION**	****	
Crop Production	****		Personal Goals	****	
Crop Income	***		Personal Relationships	****	
Natural Resources	****		Motivation	****	
Crop Production	***		Attitudes	****	
Crop Profitability	****		Personal Reactions	***	
Risks	**		People Relationships	****	
Suitability of Climate	***		Farm Way of Life	***	
Suitability of Soils	****		Career Stage	****	
Crop Possibilities	**		Property Plans	***	
Crop Yields	****		Decision-making	****	
Input Costs	***		Stress	***	
Gross Margin Potential	****		Personal/Family Aspects	***	
Market/Price Risk	**		Wife Support	****	
Production Risk	***		Community Involvement	***	
GENERAL MANAGEMENT	****		**FINANCIAL ASPECTS**	****	
Day-to-day Management	****		Short Term	****	
Strategic Management	****		Long Term	***	
Field Management	****		Financial Admin.	***	
Office Organisation	****		Cash Flow	****	
Knowledge Base	****		*Farm Ownership*	***	
Operational Management	****		Income Prospects	***	
Supervisory Support	****		Accounting Services	***	
Personal Supervision	****		Credit Rating	***	
Seasonal Planning	****		Access to Income	****	
Record Keeping	****		Impact of inflation	****	
Counselling and Advice	****		Marketability of Farm	***	
Training and Experience	***		Bond Repayments	***	
Management Structures	****		Scale of Operation	****	
Long-term Planning	***		Income Aspirations	**	

TABLE: 9.4 - SAPFACT PROFILE TRANSVAAL IRRIGATION AREA - FARMER No 18

IRRIGATION MANAGEMENT	* * * *
Water Supply & Equipment	* * *
Irrigation Know-How	* * * *
Irrigation Equipment	* * * *
Water Supply	* *
Approach to Irrigation	* * * *
Methods and Scheduling	* * * *
Operation/Maintenance	* * * *
Design/Installation	* * *
Annual Water Supply	* *
Delivery of Water	* *
Irrigation Understanding	* * * *
Attitude Water Management	* * * *
Irrigation Methods	* * * *
Scheduling Practices	* * * *
CROP PROFIT POTENTIAL	* * *
Crop Production	* * * *
Crop Income	* *
Natural Resources	* * * *
Crop Production	* * *
Crop Profitability	* *
Risks	* * *
Suitability of Climate	* * *
Suitability of Soils	* * * *
Crop Possibilities	* *
Crop Yields	* * * *
Input Costs	* * *
Gross Margin Potential	* * *
Market/Price Risk	* * *
Production Risk	* * *
GENERAL MANAGEMENT	* * *
Day-to-day Management	* * * *
Strategic Management	* *
Field Management	* * *
Office Organisation	* * * *
Knowledge Base	* * *
Operational Management	* *
Supervisory Support	* *
Personal Supervision	* * * *
Seasonal Planning	* * * *
Record Keeping	* * * *
Counselling and Advice	* * *
Training and Experience	* * *
Management Structures	* *
Long-term Planning	* * *

LABOUR MANAGEMENT	* *
Labour Relations	* * *
Labour Development	* *
Labour Force	* * *
Service Conditions	* * *
Development Actions	* *
Management Participation	* * *
Labour Organisation	* * *
Labour Situation	* * *
Attitude to Legislation	* * *
Renumeration	* * *
Development Actions	* *
Training Inputs	* *
Efficiency Contribution	* * *
Supervisory Contribution	* * *
FARMER SITUATION	* * *
Personal Goals	* * * *
Personal Relationships	* *
Motivation	* * * *
Attitudes	* * *
Personal Reactions	* * *
People Relationships	* *
Farm Way of Life	* * *
Career Stage	* * * *
Property Plans	* * *
Decision-making	* * * *
Stress	* * *
Personal/Family Aspects	* * *
Wife Support	* * *
Community Involvement	* *
FINANCIAL ASPECTS	* *
Short Term	* *
Long Term	* *
Financial Admin.	* *
Cash Flow	* * *
Farm Ownership	* * *
Income Prospects	* *
Accounting Services	* *
Credit Rating	* * *
Access to Income	* * * *
Impact of inflation	* * * *
Marketability of Farm	* * *
Bond Repayments	* * *
Scale of Operation	* *
Income Aspirations	* * *

TABLE: 9.5 - SAPFACT PROFILE TRANSVAAL IRRIGATION AREA - FARMER No 19

IRRIGATION MANAGEMENT	* * *	**LABOUR MANAGEMENT**	* * * *
Water Supply & Equipment	* *	Labour Relations	* * * *
Irrigation Know-How	* * * *	Labour Development	* * * *
Irrigation Equipment	* * *	Labour Force	* * * *
Water Supply	* *	Service Conditions	* * * *
Approach to Irrigation	* * *	Development Actions	* * * *
Methods and Scheduling	* * * *	Management Participation	* * * *
Operation/Maintenance	* * *	*Labour Organisation*	* * * *
Design/Installation	* * *	Labour Situation	* * * *
Annual Water Supply	* *	Attitude to Legislation	* * * *
Delivery of Water	* * *	Renumeration	* * *
Irrigation Understanding	* * *	Development Actions	* * *
Attitude Water Management	* * *	Training Inputs	* * * *
Irrigation Methods	* * * *	Efficiency Contribution	* * * *
Scheduling Practices	* * *	Supervisory Contribution	* * *
CROP PROFIT POTENTIAL	* * * *	**FARMER SITUATION**	* * * *
Crop Production	* * * *	Personal Goals	* * * *
Crop Income	* * *	Personal Relationships	* * * *
Natural Resources	* * *	Motivation	* * *
Crop Production	* * * *	Attitudes	* * * *
Crop Profitability	* * *	Personal Reactions	* * * *
Risks	* *	People Relationships	* * * *
Suitability of Climate	* * *	Farm Way of Life	* * *
Suitability of Soils	* * *	Career Stage	* * *
Crop Possibilities	* * * *	Property Plans	* * *
Crop Yields	* * * *	Decision-making	* * * *
Input Costs	* * *	Stress	* * * *
Gross Margin Potential	* * *	Personal/Family Aspects	* * * *
Market/Price Risk	* * *	Wife Support	* * * *
Production Risk	* * *	Community Involvement	* * * *
GENERAL MANAGEMENT	* * * *	**FINANCIAL ASPECTS**	* * * *
Day-to-day Management	* * * *	Short Term	* * * *
Strategic Management	* * * *	Long Term	* * * *
Field Management	* * * *	Financial Admin.	* * * *
Office Organisation	* * * *	Cash Flow	* * * *
Knowledge Base	* * * *	*Farm Ownership*	* * * *
Operational Management	* * *	Income Prospects	* * *
Supervisory Support	* * * *	Accounting Services	* * *
Personal Supervision	* * *	Credit Rating	* * * *
Seasonal Planning	* * * *	Access to Income	* * *
Record Keeping	* * *	Impact of inflation	* * * *
Counselling and Advice	* * * *	Marketability of Farm	* * *
Training and Experience	* * *	Bond Repayments	* * * *
Management Structures	* * * *	Scale of Operation	* * *
Long-term Planning	* *	Income Aspirations	* * *

TABLE: 9.6 - SAPFACT PROFILE TRANSVAAL IRRIGATION AREA- FARMER No 20

IRRIGATION MANAGEMENT	* *
Water Supply & Equipment	* *
Irrigation Know-How	* *
Irrigation Equipment	* * *
Water Supply	* *
Approach to Irrigation	* *
Methods and Scheduling	* *
Operation/Maintenance	* * *
Design/Installation	* * *
Annual Water Supply	* *
Delivery of Water	* * *
Irrigation Understanding	* *
Attitude Water Management	* *
Irrigation Methods	* * *
Scheduling Practices	*
CROP PROFIT POTENTIAL	* * *
Crop Production	* * *
Crop Income	* * *
Natural Resources	* * *
Crop Production	* * *
Crop Profitability	* * *
Risks	* * *
Suitability of Climate	* * *
Suitability of Soils	* * *
Crop Possibilities	* * *
Crop Yields	* * *
Input Costs	* * *
Gross Margin Potential	* * *
Market/Price Risk	* * *
Production Risk	* * *
GENERAL MANAGEMENT	* *
Day-to-day Management	* *
Strategic Management	* *
Field Management	* *
Office Organisation	* * *
Knowledge Base	* * *
Operational Management	* *
Supervisory Support	* *
Personal Supervision	* * *
Seasonal Planning	* * *
Record Keeping	* * *
Counselling and Advice	* * *
Training and Experience	* * *
Management Structures	* *
Long-term Planning	* *

LABOUR MANAGEMENT	*
Labour Relations	* *
Labour Development	*
Labour Force	* *
Service Conditions	* *
Development Actions	*
Management Participation	* *
Labour Organisation	*
Labour Situation	* * *
Attitude to Legislation	* *
Renumeration	* * *
Development Actions	*
Training Inputs	* *
Efficiency Contribution	* *
Supervisory Contribution	* *
FARMER SITUATION	* *
Personal Goals	* *
Personal Relationships	* * *
Motivation	* *
Attitudes	* *
Personal Reactions	* *
People Relationships	* * * *
Farm Way of Life	* *
Career Stage	* *
Property Plans	*
Decision-making	* * *
Stress	* *
Personal/Family Aspects	* * *
Wife Support	* * *
Community Involvement	* * * *
FINANCIAL ASPECTS	* *
Short Term	* * *
Long Term	* *
Financial Admin.	* * *
Cash Flow	* * *
Farm Ownership	* *
Income Prospects	* * *
Accounting Services	* * *
Credit Rating	* * *
Access to Income	* * *
Impact of inflation	* * *
Marketability of Farm	*
Bond Repayments	* * *
Scale of Operation	* * *
Income Aspirations	* * *

TABLE: 9.7 - SAPFACT PROFILE TRANSVAAL IRRIGATION AREA - FARMER No 21

IRRIGATION MANAGEMENT	**	**LABOUR MANAGEMENT**	**
Water Supply & Equipment	**	Labour Relations	**
Irrigation Know-How	***	Labour Development	**
Irrigation Equipment	**	Labour Force	***
Water Supply	**	Service Conditions	**
Approach to Irrigation	***	Development Actions	**
Methods and Scheduling	***	Management Participation	**
Operation/Maintenance	***	Labour Organisation	***
Design/Installation	**	Labour Situation	**
Annual Water Supply	***	Attitude to Legislation	**
Delivery of Water	**	Renumeration	***
Irrigation Understanding	***	Development Actions	**
Attitude Water Management	***	Training Inputs	**
Irrigation Methods	***	Efficiency Contribution	***
Scheduling Practices	***	Supervisory Contribution	**
CROP PROFIT POTENTIAL	**	**FARMER SITUATION**	**
Crop Production	**	Personal Goals	**
Crop Income	***	Personal Relationships	***
Natural Resources	***	Motivation	***
Crop Production	**	Attitudes	**
Crop Profitability	***	Personal Reactions	**
Risks	***	People Relationships	****
Suitability of Climate	***	Farm Way of Life	****
Suitability of Soils	***	Career Stage	**
Crop Possibilities	**	Property Plans	***
Crop Yields	**	Decision-making	**
Input Costs	***	Stress	**
Gross Margin Potential	***	Personal/Family Aspects	***
Market/Price Risk	***	Wife Support	***
Production Risk	***	Community Involvement	****
GENERAL MANAGEMENT	**	**FINANCIAL ASPECTS**	**
Day-to-day Management	**	Short Term	**
Strategic Management	**	Long Term	**
Field Management	**	Financial Admin.	**
Office Organisation	***	Cash Flow	***
Knowledge Base	***	Farm Ownership	**
Operational Management	**	Income Prospects	***
Supervisory Support	**	Accounting Services	***
Personal Supervision	***	Credit Rating	**
Seasonal Planning	***	Access to Income	***
Record Keeping	***	Impact of inflation	***
Counselling and Advice	***	Marketability of Farm	**
Training and Experience	***	Bond Repayments	***
Management Structures	**	Scale of Operation	***
Long-term Planning	**	Income Aspirations	***

TABLE: 9.8 - SAPFACT PROFILE TRANSVAAL IRRIGATION AREA - FARMER No 22

- It is not true that a farmer values equipment or services only if he pays for them

- Irrigation farming is labour-intensive, which will have major economic consequences in the future, placing a premium on developing present labourers to be active participants in the organisation and management of the irrigation function.

The increasing attention being given to small farmers, facing circumstances unfamiliar to the specialist, has emphasised that "perceptions" of the farmer involved are just as important as "facts" available to the specialist. Internationally, there is recognition of this, particularly by agencies concerned with development funding.

Significant *verbatim* comments by farmers covering a broad spectrum of their perceptions and activities are included in Appendix B.

10.1.4 Farming Practices

Semi-structured open-ended interviews proved to be particularly effective in obtaining insights into farming practices. This is of particular importance when technical aspects, such as irrigation and mechanisation, are directly related to these practices. It was noticeable that two interviews undertaken on sugar farms captured the essence of the "hows" and "whys" of irrigation in the area. The technical detail that emerged from these interviews was comprehensive and detailed and explained anomalies that had been concerning design engineers with considerable experience in this field.

10.1.5 Irrigation Management

The interviews have emphasised the relatively low priority that most farmers place on irrigation management, and the almost complete dearth of effective irrigation extension. There is, possibly, a link between the two. Effective extension is not possible if the subject is not important to the farmer! There can be no doubt that more effective management would be in the interests of both the farmer and the country but this will require a new approach based on farmer perceptions and priorities. The most effective way to improve irrigation management appears to be by achieving greater farmer understanding of irrigation principles, possibly by means of individual counselling.

10.1.6 Training

A first concern is with the generally inadequate understanding of the day-to-day operation of irrigation on a farm. Experience in the mechanisation field has shown the importance of training the operator, the person that actually does the irrigating, rather than the farmer who is not really interested and is unlikely to be able to pass the information on down the line. Irrigation training has lagged behind mechanisation training, although there are some useful programmes.

The content of training programmes is important. Only too often training is based on a rehash of only partially applicable "book learning" and is not sufficiently related to the specific needs of the operators. Irrigation training programmes should include the basics of pre-programmed irrigation,

CHAPTER 10

CONCLUSIONS AND RECOMMENDATIONS

10.1 CONCLUSIONS

10.1.1 Importance of qualitative research in Agriculture and Engineering

This is an exploratory project but it has shown that there is a place for qualitative research in Agriculture and Engineering, as there is in Medicine. Technical specialists with the necessary aptitude and an adequate introduction to techniques can enrich investigations, both at research and at operational level, by applying the basic principles of qualitative research. SAPFACT is an innovative attempt to facilitate the interpretation of interviews undertaken by people trained in the rigid disciplines of science and engineering.

10.1.2 Important Role of Farmers

The project emphasises the potential role of the individual farmer, in contributing to the design of new technology and development programmes. SAPFACT is a tool that can be applied by advisory personnel, researchers and commercial concerns in their direct dealings with farmers to establish a realistic profile of resource- and people-based strengths and weaknesses.

10.1.3 Perceptions

The project has disclosed that the perceptions that "we" have of "them" can be very wide of the mark. Decisions are based on the decision-maker's perception of the facts at his disposal; consequently, decision-making is not altogether mathematical or objective. The perceptions of the person carrying out the decision, in this case, the farmer, are also an important factor in the appropriateness of proposals. This research showed that the following has to be taken into account:-

- Irrigation tends to be a chore to most irrigation farmers and is nowhere near top of their priority list
- Water wastage is a consequence of anxiety about under-watering and not an irresponsible disregard for natural resources
- Irrigation increases rather than reduces the risk factor in farming
- Farmers may have good reason not to accept the recommendations of engineers and scientists

elementary measurements of irrigation applications, simple evaluations of profile water status and equipment inspection and maintenance.

10.1.7 Labour Development

The survey emphasised the value of the support provided by employees who had developed from being labourers to being active participants in the organisation and management of the irrigation function.

10.2 RECOMMENDATIONS

The important contribution that qualitative research techniques, based on open-ended interviews, can make to commercial irrigation farming and planning, has been demonstrated by this pilot project. Internationally and in the RSA, similar techniques, including Participatory Rural Appraisal (PRA), have gained acceptance in small farmer development. The procedures are suitable for use by technical specialists after initiation into the techniques and are time- and cost-effective.

It is recommended that these techniques, including the computer program SAPFACT, be drawn to the attention of people concerned with irrigation and water supply, by means of publications and workshops.

CHAPTER 11

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APPENDIX A

THE SONDEO EXPERIMENT

CONTENTS

1 INTRODUCTION

As discussed in paragraph 3.4 of the report, a Sondeo survey was undertaken in the Brits irrigation area near Pretoria. The purpose was to gain experience with the technique and to prepare for a Farmers' Day.

The pilot project researcher acted as Coordinator and was able to relate this approach to open-ended interviews with farmers with the semi-structured taped interview approach applied generally in the project. Appendix A is limited to the original paper published by Peter Hildebrand, and to extracts from the discussions held during the Brits survey. These extracts can be compared with the more exhaustive ones drawn from the main survey and reproduced in Appendix B.

The Sondeo situation summary that was developed by the group of specialists who subsequently presented the Farmer's Day is included for completeness.

2 THE APPROACH

COMBINING DISCIPLINES IN RAPID APPRAISAL: THE SONDEO APPROACH

Peter E. Hildebrand (1981)

2.1 Introduction

Several characteristics are critical to an efficient and functioning multidisciplinary effort: first, those concerned must be well trained in their own field; secondly, they need a working understanding of -and must not be afraid to make contributions in - one or more other fields. Team members must not feel the need to defend themselves and their field from intrusion by others. Working together, all members of the team should view the final product as a joint effort in which all have participated and for which all are equally responsible. That means that each must be satisfied with the product, given the goals of the team, and be willing and able to defend it.

Perhaps the most critical characteristic required to achieve success in a multidisciplinary team is this identification with a single product in which all participate. The product can be complex and involve a number of facets but it should result from the joint effort of the whole team and not contain strictly identifiable parts attributable to individual team members. Failures of multidisciplinary efforts in agricultural institutions frequently result because teams are organised as committees that meet occasionally to "co-ordinate" efforts, but in which the crop work is left to the agronomists, the survey to the anthropologists, and the desks to the economists. In these cases, there is not a single identified product but, rather, several products or reports purported to be concerned with the same problem.

2.2 *Team efforts in agricultural institutes*

In the generation of improved agricultural technology for small traditional farmers, all multidisciplinary team members must be oriented towards and identified with "technology" as the "product" of the team (normally just the agronomists or animal scientists identify with the product). All must be willing to consider a wide range of variables and constraints, and not leave these worries only to the anthropologists or sociologists. Further, all members must be willing to spend some desk time considering alternatives and their consequences on the client's goals, and not leave this just to the economists. The agronomists should be able and willing to criticise the economic or social aspects of the work, and the social scientists, the agronomic aspects. In turn, these criticisms should be used to improve the product so that all can be satisfied with the final result.

In most agricultural institutes, agronomists (who usually greatly outnumber the social scientists) are concerned about too much influence from the socio-economic group in work at the farm level. This is manifest in resistance by agronomists to identifying too closely with the farmers, even with those on whose land they conduct trials. It also surfaces with respect to the evaluation of technology. The agronomist is much more comfortable if a final evaluation follows the farm trial phase of the work where he, himself, makes the evaluation. The agronomist, then, decides if a technology is "good". If, later, the farmer evaluates this "good" technology and does not accept it, the

agronomist considers it a problem for the extension service, or of poor infrastructure, of low prices, or of lack of initiative on the part of the farmer himself, but not a problem for the agronomist, who has produced what he considers to be a "good" product. In this situation, evaluation by the farmer is equated with influence by socioeconomists, who dare ask the farmer his opinion and who would tend to take into consideration more variables, including the present weaknesses in infrastructure, the price level, the farmers' capabilities, etc., in the development of a technology so that the product of the team's efforts could be used immediately without the need to await the development of other facets of the sector.

2.3 The SONDEO: a team rapid survey approach

The Sondeo is a modified survey technique developed by the Guatemalan Institute of Agricultural Science and Technology (ICTA), as a response to budget restrictions, time requirements and the other methodology utilised, to augment information in a region where agricultural technology generation and promotion is being initiated.

In order to understand the methodology, it is first necessary to understand how ICTA is organised at the regional level. Each of the regions in which the Institute functions has a Regional Director who is the representative of the Director General of the Institute and of the Technical Director. Within the region, each area in which work is being carried out is in charge of a "Sub-regional delegate", a technician who has a minimum amount of administrative responsibilities. All the technicians, from whatever discipline or programme, who work in the area, are responsible to him. The multidisciplinary team is usually comprised of some or all of the following: plant breeders, pathologists, a socio-economist and approximately four general agronomists, who are the Technology Testing Team. This group, backed up by the national Coordinators of Programmes (corn, beans, etc.) and Support Disciplines (socio-economics, soil management) are responsible for orienting and conducting the generation and promotion of technology in the area. The work includes basic plant breeding and/or selection on the (usually small) experiment station in the area, farm trials, tests by farmers of promising technology, evaluation of the acceptability of the technology tested by farmers, and economic production or farm records maintained by farmers with the help of the technicians. In order to provide the original orientation to the team, the Sondeo, or reconnaissance survey, is conducted by members of the Technology Testing Team who are going to work in the area, sometimes personnel from an appropriate Programme, and a team from socio-economics, comprised of one or more of the following: anthropologists, sociologists, economists, agricultural economists and/or engineers. Usually there are five people from socio-economics and five from the Technology Testing Team who form a ten-man Sondeo team for an area.

The purpose of the Sondeo is to provide the information required to orient the work of the technology generating team. The cropping or farming systems are described, the agro-socioeconomic situation of the farmers is determined and the restrictions they face are defined, so that any proposed modifications of their present technology are appropriate to their conditions.

If ICTA is to work in an area that is not previously defined, such as by the bounds of land settlement or an irrigation project, one of the objectives of the Sondeo is to delimit the area. This is done by first selecting the predominant cropping or farming system used by potential target farmers in the area and later determining the area in which this system is important. The reason why an homogeneous traditional or present cropping or farming system is used is that it is this system that ICTA will be modifying with new or improved technology. Hence, having a well-defined homogeneous system with which to work simplifies the procedure of generating and

promoting technology. The premise on which the selection of an homogeneous cropping or farming system is based is that all the farmers who presently use it have made similar adjustments to a set of restrictions which they all face and, since they made the same adjustments, they must all be facing the same set of agrosocio-economic conditions.

As well as delimiting the area of this homogeneous system, the tasks of the Sondeo team are to discover what agrosocio-economic conditions all the farmers who use the system have in common and then to identify which are the most important in determining the present system and therefore would be the most important to consider in any modifications to be made by the team in future., Finally, the end product of the Sondeo is to orient the first year's work in farm trials and variety selection. It also serves to locate future collaborators for the farm trials and for the farm record projects.

Because the farm trials are conducted under farm conditions, during the first year they provide an additional learning process into the conditions that affect the farmers and are invaluable in acquainting the technicians with the realities of farming in the area. The farm records - which are also initiated in the first year - provide quantifiable technical and cost information on the technology being used by the farmers. At the end of the first year's work, then, the technicians have not only been farming under the conditions of the farmers in the area, but they also have the information from the farm record project. For this reason, it is not necessary to obtain quantifiable information in the Sondeo, which is not a benchmark study. Quantifiable information for impact evaluation in the area is available from farm records, which increase in value each year.

2.4 The SONDEO procedure

The primary purpose of the Sondeo, then, is to acquaint the technicians with the area in which they are going to work. Because quantifiable information is not required following the survey in order to interpret the findings, no questionnaires are used, so farmers are interviewed in an informal manner which does not alienate them. At the same time, the use of a multidisciplinary team serves to provide information from many different points of view simultaneously. Depending on the size, complexity and accessibility of the area, the Sondeo should be completed in from 6 to 10 days at minimum cost. Areas of from 40 to 150 km^2 have been studied in this period of time. The following is a description of the methodology for a six-day operation:

Day 1

The first day is a general reconnaissance of the area by the whole team as a unit. The team must make a preliminary determination of the most important cropping or farming system that will serve as the key system, become acquainted in general terms with the area, and begin to search out the limits to the homogeneous system. Following each discussion with a farmer, the group meets out of sight of the farmer to discuss each one's interpretation of the interview. In this way, the team members begin to become acquainted with how other members think. Interviews with farmers (or other people in the area) should be very general and wide- ranging because the team is exploring and searching for an unknown number of unknown elements. (This does not imply, of course, that the interviews lack orientation.) The contribution or point of view of each discipline is critical throughout the Sondeo because the team does not know beforehand what type of problems or restrictions may be encountered. The more disciplines that are brought to bear on the situation, the greater is the probability of encountering the factors which are, in fact, the most critical to the farmers of the area. It has been established that these restrictions can be agro-climatic, economic

or socio-cultural. Hence, all disciplines make equal contributions to the Sondeo.

Day 2

The interviewing and general reconnaissance of the first day serve to guide the work of the second day. Teams are made up of pairs: one agronomist or animal scientist from the Technology Testing Team and one person from socio-economics who work together in the interviews. The five teams scatter throughout the area and meet again either after the first half day (for small areas or areas with good access roads) or day (for larger areas or where access is difficult and requires more time for travel). Each member of each team discusses what was learned during the interviews and tentative hypotheses are formed to help explain the situation in the area. Any information concerning the limits of the area are also discussed to help in its delimitation. The tentative hypotheses or doubts raised during the discussion serve as guides to the following interview sessions. During the team discussions, each of the members learns how interpretations from other points of view can be important in understanding the problems of the farmers of the region.

The importance of these discussions following a series of interviews cannot be over-stressed. Together, the group begins to understand the relationships encountered in the region, delimits the zone and starts to define the type of research that is going to be necessary to help improve the technology of the farmers. Other problems, such as marketing, are also discussed and, if solutions are required, relevant entities can be notified. It is important to understand the effect that these other limitations will have, if not corrected, on the type of technology to be developed, so that they can be taken into account in the generation process. During the second day, there should be a notable convergence of opinion and a corresponding narrowing of interview topics. In this way, more depth can be acquired in following days on the topics of increasing interest.

Day 3

This is a repeat of Day 2 and always includes a change in the makeup of the teams after each discussion. At least a minimum of four interview-discussion cycles is necessary to complete this part of the Sondeo. If the area is not too complex, these cycles should be adequate. Of course, if the area is so large that a full day is required for interviewing between each discussion session, then four full days are required for this part of the Sondeo.

Day 4

Before the teams return to the field for more interviews on the fourth day, each member is assigned a portion or section of the report that is to be written. Then, knowing for the first time for what topic each will be responsible, the teams, regrouped in the fifth combination, return to the field for more interviewing. For smaller areas, this also is a half day. In the other half day, and following another discussion session, the group begins to write the report of the Sondeo. All members should be working at the same location so that they can circulate freely and discuss points with each other. For example, an agronomist who was assigned the section on maize technology may have been discussing a key point with an anthropologist and needs to refresh his memory about what a particular farmer said in a brief discussion with him. In this manner, the interaction among the disciplines continues.

Day 5

As the technicians are writing the report, they invariably encounter points for which neither they nor others in the group have answers. The only remedy is to return to the field on the morning of the fifth day to fill in the gaps found the day before. A half day can be devoted to this activity, together with finishing the writing of the main body of the report. In the afternoon of this day, each team member reads his written report to the group for discussion, editing and approval. As a group, the team should approve and/or modify what is presented.

Day 6

The report is read once again and, following the reading of each section, conclusions are drawn and recorded. When this is finished, the conclusions are read once again for approval, and specific recommendations are then made and recorded, both for the team who will be working in the area, and for any other agencies that should be involved in the general development process of the zone. The product of the sixth day is a single report generated and authored by the entire multidisciplinary team, and should be supported by all. All of the members should be able to defend all the points of view discussed, and the conclusions and the recommendations made.

2.5 The report

To a certain extent, the report of the Sondeo is of secondary value because it has been written by the same team that will be working in the area. Most of its value lies just in the fact that they have written it. By being forced into a situation where many different points of view had to be taken into consideration and coalesced, the horizons of all will have been greatly amplified. Further, the report can serve as orientation for non-participants, such as the Regional Director or the Technical Director, in discussing the merits of various courses of action. However, it is also obvious that the report will appear to be one written by ten different persons in a hurry, which is just exactly what it is! It is not a benchmark study with quantifiable data that can be used in the future for project evaluation; rather, it is a working document to orient the research programme and it served one basic function in just being written.

2.6 Concluding remarks

The disciplinary speciality of each member of the Sondeo team is not critical, so long as there are several discipline represented, and, if the Sondeo is in agriculture, a significant number of them are agriculturalists. At least some of these should also be from among those who will be working in the area in the future. The discipline of the Coordinator of the Sondeo is probably not critical, either, if he is a person with a broad capability, an understanding of agriculture (if it is an agricultural Sondeo), and experience in surveying and survey technique. However, the Coordinator must have a high degree of multidisciplinary tolerance and be able to interact with all the other disciplines represented on the team.

The Coordinator, in a sense, is an orchestra director who must ensure that everyone contributes to the tune but that, in the final product, all are in harmony. He must control the group and maintain discipline. He arbitrates differences, creates enthusiasm, extracts hypotheses and thoughts from each participant and ultimately will be the one who coalesces the product into the final form. It is perhaps not essential that he has prior experience in a Sondeo, but it would certainly improve his efficiency if he had.

3 EXTRACTS FROM "REPORT-BACKS" DURING THE BRITS EXPERIMENT

- A farmer with great experience queries the application of scheduling procedures because water supply is largely out of the hands of the farmer. Canal capacity is limited, irrigation water management is influenced by turns, cancellations and dry weeks. The management of the canals is now going over to irrigation boards and the impact of privatisation has still to be assessed.

- We decided that we had to have a look at the irrigation farming in general and found that there was no understanding of irrigation scheduling. When asked, 80% replied that their system could deliver 50 mm in a 14-day cycle and, from planting onwards, that's what they did. The total water use was 600 mm, but results were bad, because the crop was water-logged early on and dried out later in the season. Wheat's peak requirement is about 7 mm/day while early season it is only 1 mm with the result that the crop was waterlogged, nitrogen leached and the soil denitrified. The first need was to get the farmers to appreciate that irrigation requirements varied over the season. We tackled scheduling step-by-step and started with the Green Book tables and this got the basic principles across. The progression should be table > A-pan > tensiometer.

- All our people are specialists in tobacco. Last year we started to put considerable emphasis on getting the profile up to field capacity before planting. Some farmers understand the principle, others find it difficult to grasp that you can irrigate dry lands and retain the water. We have also had problems with farmers over-irrigating early in the season and it is to be doubted if the irrigation position is entirely satisfactory. We have, however, been able to keep the chloride position under control, largely because of the good cooperation we have received from the farmers in regard to irrigation.

- There is much evidence to show that the timing of irrigation is more important than how much water is applied in total. In developing a drought strategy, this is basic. Both the grain and tobacco co-operatives have demonstrated how following simple seasonal irrigation application tables can greatly improve both yield and quality. The management load is small and there is great appreciation from the initiated. However, there is a long way to go before there is general acceptance of programmes. Programming tables tend to concentrate on one crop at a time, so how can more than one crop be catered for, especially when both summer and winter crops are involved? There is evidence that, while farmers received their full quota, they are now experiencing shortages with their winter crops because water was applied to save the summer crops when the unprecedented drought hit in January.

- When I moved to Brits recently, I carried out a limited survey and found that farmers do not attain exceptionally high yields, and that this is not their primary aim. They regard irrigation as being a high- cost item and labour intensive. They like a fixed pattern of irrigation. Their crop knowledge is good but their feel for climatic factors such as rainfall is less well developed. Each person has his own perception of what constitutes a "light" irrigation; 30 mm I regard as light but commonly here this would be 10-12 mm. There doesn't seem to be much attention given to the use of irrigation scheduling aids; even time switches on pumps seem to be a rarity. The average system capacity is 6 mm/day

- The information is available but the extension officers do not have the time to visit the

farmers and discuss their problems. It doesn't work to go to a farmer and tell him he has a problem - you must wait till he comes to you. One of our farmers who knows us and what we offer well, has gone bankrupt because of his irrigation. He had the best equipment but his yield was only 2.5 to 3 tons. We found that all his practices where sound - even his total water application was good. All I had to do was to sort out his irrigation distribution and this pushed his yield up to 5.5 t/ha. They know we are here but they don't use us.

* I am going to start in 1970 when sprinkle started here, about when the first designer's courses were held by Water Affairs and Agriculture. We had been battling with design and had problems with come-backs. Now we have a wealth of experience. In those days, we used to measure infiltration using the old square box and used to assess the texture and water-holding capacity of the soils using the standard tests of rolling the wet soils etc. We used to pass this knowledge on to our customers. Experience is important in the case of farmers as well. Newcomers very often fail despite training or education. Hendrik Schoeman once remarked that there are far more uneconomic farmers as farming units.

* There are five aspects that the farmer can change when operating a sprinkler system.
Hours of irrigation per day.
Nozzle size.
Number of shifts per line.
Number of line shifts per day.
System spacing.

A great deal can be achieved management-wise, by playing tunes on these five factors without changing the system. I have developed a computer programme to assist with the management so that one can modify the daily application at various times in the season.

* The importance of irrigation equipment and its management in the whole farm context can be debated. However, there is more than enough evidence to show that farmer understanding of the selection, management and maintenance of equipment is unsatisfactory. Inevitably, and correctly, farmers seek new methods that will help reduce the "hassle" of coping with the day-to-day problems of farming. This was the main motivation for the move from flood to sprinkle. Now it is the move to pivots and micro and drip: should they or shouldn't they? It is obvious from the visits that much needs to be done to improve farmer understanding of the basics, although this may be low on their priorities!

* Sadly, even amongst the larger farmers visited, there were some that had been leaders ten years ago but were no longer "with it." They still worked hard but the world around them had changed. Some of these farmers were bitter and negative. There were others who undoubtedly knew it all but were impractical and did not have the organisational ability to "get things done". One farmer, who had better remain nameless, commented that "A man who has had a job in business or industry makes a good farmer - at least he is used to doing a full day's work!"

* There is a wide range of farm size and sophistication. The Sondeo visits concentrated on the larger farms and one can expect that most of the farmers at the Farmers' Day will be from the same group. However, the bulk of farmers are still small farmers and 60 % of the irrigation is flood. The small farmers are trapped by their size. The farm cannot support a

a retired father and an active son so that the older men hang on and there is frustration among the sons. Financially and intellectually, there is little opportunity for innovation.

- No farmer can be confident of surviving a serious drought situation but the larger diversified farmer has the option of being able to eliminate the less profitable enterprise or cultivate less land and still cover overheads. The average farmer does not have these options. Many farmers have access to additional water sources, such as boreholes and their dams, but one wonders if their management of these assets justifies their evident optimism.

4 SONDEO SITUATION SUMMARY FOR IRRIGATION FARMERS' DAY PRESENTERS

4.1 General

These notes were prepared to assist the Sondeo team with their final preparations for the Farmers' Day. Each member was a participant in a group presentation and subsequent discussion.

The general theme of the day is DO THINGS BETTER. Irrigation management is important but even in times of drought will not be the first concern of the farmer. The priority is what to grow and how much. Our concern is to mesh this with irrigation. The options open to a farmer are limited and will be determined by his circumstances.

4.1.1 Brits farmers are diversifying. Moves have been made to supplement wheat and soya with paprika and peppers that can provide stability with reasonable profitability. Onions and other vegetables can provide high profits but are speculative. "Tobacco made me rich; vegetables are making me poor". Farmers are looking to permanent crops such as citrus and vineyard for long- term stability and reduced electricity costs. Farmers who have had to go out of tobacco are still looking for substitutes.

4.1.2 The approach to production and marketing adopted by the tobacco co-operative has resulted in intensive extension, study groups and an interchange of technical information. The extension activities of the grain co-operative are much appreciated, but vegetable production is characterised by competition, little extension and a desire to keep successful methods secret. This is understandable, but because of the importance of vegetable production, unfortunate.

4.1.3 The part that wives can play was mentioned several times. This ranged from farms where the wife was taking the full responsibility for the farm to one where the wife expressed extreme frustration at being excluded from farming activities. Several wives had done computer courses and were responsible for record-keeping, including irrigation records.

4.1.6 All the above factors need to be considered when drought strategies are developed. No farmer can be confident of surviving a serious drought situation but the larger diversified farmer has the option of being able to eliminate the less profitable enterprise or cultivate less land and still cover overheads. The average farmer does not have these options. Many farmers have access to additional water sources such as bore holes and their dams but one wonders if their management of these assets justifies their evident optimism.

4.2 Equipment

Whether of irrigation equipment and its management is the most important factor in the whole farm context can be debated. However, there is more than enough evidence to show that farmer understanding of the selection, management and maintenance of equipment is unsatisfactory. Inevitably, and correctly, farmers seek new methods that will help reduce the "hassle" of coping with the day to day problems of farming. This was the main motivation for the move from flood to sprinkle. Now they are wondering whether they should move to pivots and micro and drip. It is obvious from the survey visits that much needs to be done to improve farmer understanding of the basics, although this may be low on their priorities!

4.2.1 There is a general lack of awareness of the factors that determine the performance of a sprinkler system. It is assumed that all is well if water is seen to be applied to the land. Similarly, there is no appreciation of the consequences of nozzle wear.

4.2.2 It is assumed that sprinkle must be less troublesome and more efficient than flood but little thought has been given to "modernising" flood. Some farmers are thinking in this direction because of their high ESCOM accounts and the realisation that, to be effective, sprinkle requires maintenance, and that costs money.

4.2.3 The impact of the inefficiencies resulting from poor management and maintenance can be serious in drought years.

4.2.4 There is a preoccupation with the influence of wind on irrigation, pivot as well as conventional sprinkler, and this is one motivation for using drop arms and 12 by 12 sprinkler spacing. This is strange in an area known for calm wind conditions. Perhaps there are other causes of poor water distribution.

4.2.5 There is obvious resistance to the mechanical damage that arises through pipe moving and a feeling that, both in design and materials, equipment is unsatisfactory.

4.2.6 Most farmers appreciate that they need guidance but some are dogmatic when ordering equipment from a supplier. The customer may always be right but the view was expressed that the supplier should make every effort to explain to the client that what he is requesting is wrong, and why it is wrong.

4.2.7 When faced with water shortages, many farmers wonder if the solution lies in changing to another method such as drip. What advice can be given in our Farmers' Day.

4.2.8 Pivots are attractive and expensive! There are examples of very small pivots and very large pivots in the Brits area and, because of the small lands, many cases where less than a full circle is being irrigated. What advice can be given?

4.2.9 Labour has always been a concern in irrigation. With the coming of labour legislation, the position is going to become much more difficult and the interest in more automated systems will increase. Again, what advice can be given?

4.3 Water management programmes

There is much evidence to show that the timing of irrigation is more important than how much water is applied in total. In developing a drought strategy, this is basic. Both co-ops have shown how the application of simple seasonal irrigation application tables can greatly improve both yield and quality. The management load is small and there is great appreciation from the initiated. However, there is a long way to go before there is general acceptance of programmes.

4.3.1 Under drought conditions, there are options. What is the likely adverse effect of planting the same area and cutting back on irrigation amounts; can other tables be issued for drought conditions? There is evidence to show that, for wheat, a cut-back of 30 % from the normally calculated table would have a negligible effect on yield. What is the position with other crops?

4.3.2 Programming tables tend to concentrate on one crop at a time. How can more than one crop be catered for when both summer and winter crops are involved? There is evidence that, although farmers received their full quota, they are now experiencing shortages with their winter crops. This was because water was applied to save the summer crops when the unprecedented drought hit in January.

4.3.3 An essential part of programming is to measure the actual irrigation applications and rain in catch cans but there is some doubt about how much of the rain should be regarded as being effective.

4.3.4 Many farmers are dependent on their quota only and this means that there is only sufficient water for one full irrigated crop, either summer or winter. What advice can be given?

4.3.5 The actual application depth is important and is related to frequency. BEWAB uses the concept of PAWC in developing programmes and this approach can be applied as a refinement to the Green Book based programmes now being used.

4.3.6 Some farmers expressed the view that, while scheduling and programming might be a good thing for saving water, they would have little impact on yield under normal circumstances and would consequently not be worthwhile.

4.3.7 For intensive crops, irrigation has a significant influence on product quality and this would need to be considered in any programme. However, where quality demands operating towards the dry limit, accurate "real time" scheduling is required and programming might have limited application.

4.3.8 There are crop-specific problems. One large producer of lucerne appeared to be having some difficulty with programming irrigation. There was also a feeling that Paprika required further research.

4.3.9 A reason for the popularity of pivots is that management is simplified because application depths and cycle times can be varied easily while, with sprinkle, this is generally considered not possible. With good management, much the same flexibility can be got with sprinkle.

4.4 Irrigation measurements

Programmes (normally worked out in advance) are only the first step in irrigation water management, and the moment further refinement is desired, measurement becomes important to facilitate scheduling. It is also difficult to understand irrigation without measurement and effective management requires understanding. Measurement can be simple or complex but, to be effective, it must be done correctly.

For the Farmers' Day, measurement has a further implication. To develop drought strategies and to consider anything other than "full" irrigation, it is essential to resort to norms developed from research results based on measurements made under controlled conditions.

4.4.1 Measuring irrigation water application is essential. The farmers seemed to have little knowledge as to how this can be done. For example one needs to know where to position catch cans to get valid results.

4.4.2 Sprinkler performance assessment requires knowing pressures and discharges.

4.4.3 Irrigation water management requires that the water status of the soil should be monitored at regular intervals. Some farmers indicated that they were considering buying a soil auger for this purpose but were very vague about its use. Several had bought tensiometers but needed guidance on installation and use.

4.4.4 Several farmers spoke of controlling water applications to assure product quality and stressed that the objective should be profit and not simply yield. Such strategies demand accurate measurements.

4.4.5 Some farmers had attempted to use the A-pan for scheduling purposes but had not continued. Very little mention was made of atmospheric demand as an aid in irrigation water management. This is an approach applicable to more sophisticated crops and management and is one where the installation of automatic weather stations by groups of farmers would be more than justified.

4.4.6 The filling of the soil profile before planting is advocated for tobacco but it is difficult to judge the amount of irrigation to do this in practice. It is obviously a great help if a farmer has a feel for infiltration rate, field capacity, wilting point and the PAWC of his soils but can he do rough tests for himself?

4.5 Electricity, soils and water

These main resources have a major influence on normal irrigation practices and any drought strategies that may be developed. ESCOM costs are becoming a significant factor and the encouragement being given to low-peak operation could have a major effect on design and operation of irrigation systems. Water quality has long been a major issue in the Brits area. The soils are unusual in that they are either very heavy or are gravelly with a low water-holding capacity. This is an area where "standard solutions" are seldom applicable.

4.5.1 The high costs of electricity will undoubtedly stimulate night irrigation, unless the farmers find this to be more trouble than it is worth. The introduction of the new tariffs

disturbs the status quo and informed judgement will be required.

4.5.2 A farmer with great experience queries how he can apply scheduling procedures because water supply is largely out of the hands of the farmer. Canal capacity is limited and irrigation water management is influenced by turns, cancellations and dry weeks. The management of the canals is now going over to Irrigation Boards and the impact of privatisation has still to be assessed.

4.5.3 The management of boreholes and private dams in times of drought is important.

4.5.4 All the farmers are very aware of the issue of water quality but it is doubted if enough attention is being given to the management of irrigation under the water quality situation that applies at Brits. The possible introduction of water quality regulations restricting sprinkle irrigation could have major implications.

4.5.5 Filtration is important for low pressure pivots and micro and drip, and farmers are experiencing problems. This indicates a need for better filter management.

APPENDIX B

SELECTED EXTRACTS FROM INTERVIEW TRANSCRIPTS

CONTENTS

1. INTRODUCTION

The interviews with the farmers opened up new perspectives for the researchers. It was as if a curtain had been pulled aside and, for the first time, many anomalies were explained. Attempts have been made in Chapter 4 to summarise the information gleaned from the interviews but, as is so often the case with qualitative research, this is a subjective assessment. An analyst with a different background and interests might draw other conclusions. These verbatim extracts from the interviews are offered here, without comment, in the belief that they will be of interest, and possibly value, to others concerned with irrigation farming.

2. IRRIGATION WATER MANAGEMENT

2.1 Economic importance, yields and quality

* With dryland farming, you plan for a conservative harvest and, every now and again, you get a year with exceptional rains and end up with a very welcome boost to your bank balance. Irrigation doesn't work that way. When you have planned for 6 tons of wheat or 10 tons of maize and you harvest just one ton less, you find yourself with a problem. How can you ever catch up? Most irrigation farmers plan conservatively; they dare not take chances.

* When Prof. Bennie started to visit us, we used to talk of wheat yields of 44 bags/morg. We used to follow rule of thumb methods of irrigating, but I pushed the yield up to 5 - 6 tons/ha over a period of 5 years. The groundnuts climbed from 1,3 to between 2,5 and 3 tons, largely as a result of the better use of water. We didn't apply more water; we used the same number of dams per hectare but our distribution was better.

* Last year, on a specific section of apple orchards with good soils and slope, I pushed up the yield of Goldens from 78 tons/ha to 104 tons/ha by the right water applications, pruning and general management practices.

* So you say I use less water than anyone else? It comes back to the quality of the product. I have been conditioned by my experiences in the old days when I got prizes for the quality of my peaches, best keepers, and exported melons to London with only 3% losses as a consequence of not over-irrigating. Others pushed their fruit too much. When Pan van Zyl was the winemaker at the Co-op, he used to make high quality wine from my grapes, showing that not pushing can apply to vineyards too.

* Sprinkle irrigation was introduced in 1960 and pivots followed in 1981. The accepted irrigation application for potatoes was 25 mm per week. Originally, tensiometers were used but, now, the A-pan and crop coefficients are preferred. Scheduling is absolutely critical to obtain the high quality which is essential to ensure stable markets. By keeping the land slightly on the dry side, I achieve yields of 4000 10-kg bags per ha of top quality potatoes with excellent shelf life.

* The yield of seed the first year was 4.59 tons/ha. The Greytown people could not believe the yield and came up to check it out but, in later years, total production went up to 8 tons/ha, using less water because of higher efficiencies achieved by better scheduling.

Over this period, I reduced fertiliser applications appreciably because I started off giving too much.

2.2 Water management in practice

* A farmer with great experience queries the application of scheduling procedures because water supply is largely out of the hands of the farmer. Canal capacity is limited and irrigation water management is influenced by turns, cancellations and dry weeks.

* One of the problems with the water from the scheme is that, in critical times, if you have a breakdown, you have to cancel the water because you do not have sufficient capacity in the storage dam. You can never catch up again because you will be limited to the normal half cusec supply. You remain three days behind. With a borehole, you can keep going day and night for three days if necessary.

* People are trying a different tactic: limited irrigation. You plant wheat and groundnuts, aiming at dryland yields for a good rainy season, and you work out the water requirements using BEWAB. If it doesn't rain as it should, you irrigate to compensate. More and more farmers here are going for this approach. My neighbour did it last year and had more money in his pocket than I had.

* But it is really more supplementary than total irrigation on the cane. We can't apply sufficient water in really dry hard periods; we are always behind. To be able to do a total irrigation, we will have a much higher ESCOM account and require probably at least 50% more equipment and upgraded pumps. I doubt if that would be economic in terms of the return. So you have got to take a bit of a chance. So maybe we lose a little bit of production because we can't apply full irrigation at peak periods.

* I am always afraid of a water shortage. A pump can have a breakdown, or the wind can bring a power line down. We are a long way from Bloemfontein and, by the time you get the pump repaired, you have lost four days. In hot weather, there is no way you are going to be able to catch up. I get my pumps going and, when I see the water running out of the land, I ease up a bit. Anything to prevent being caught with a dry profile.

* Some farmers believe that roots grow in search of water but I believe that roots grow where there is water. My approach is to irrigate to keep pace with the main root development. I have always adopted an intuitive approach to irrigation and rely a great deal on "gevoel". I check by walking through the crop but, because of the short irrigation cycle, by the time the plants show stress, the sub-soil has dried out. Auger shows the position. I concentrate on the upper 600 mm of the horizon.

* We are all optimists here and plant just a little more than the system can handle. When you are trying to establish a crop, and there is another one in the system which is at the peak of its requirements, you are trying to keep them both happy and you lose out a bit on both. You see the clouds coming up and you hope the rain will come that night.

* There are pivots in this area that have given only two tons/ha, not because of hail or pollination, but simply as a consequence of drought. Now the reason for that is that,

instead of listening to the reports from the weather stations, the farmers look up at the mountains, see a cloud, and assume it is going to rain. They still believe they have enough water left in the soil to get through. They look again and, ten days later, the rain still has not come and they start pumping. The maximum application they can put on is 6 mm/day and they need 8 mm at least on a hot day. They are 80 to a 100 mm behind, and the best soils here can only carry 140 mm. They are lost; the crop has gone because it is not going to rain again.

2.3 Extension (technology transfer)

* Many irrigation farmers and managers have developed, over years of past experience and intimate contact with the crop, soil and climate, the ability to irrigate the correct amount at the right time, without the help of sophisticated instruments or scientifically based irrigation scheduling procedures. The decision-making criteria developed and used by these farmers, irrigating on intuition, are mostly applicable to one set of farming circumstances only. The problem is that many farmers never developed this intuition and newcomers to irrigation farming do not have the time or money to develop the required intuition through experience. These people need irrigation scheduling techniques that are affordable, comparatively easy to use, and will result in considerable yield increases and/or water or energy savings.

* Firstly, the farmer reaches a stage where he actually tries to offload as much as possible to try and keep his life simple. He has a busy, complex life, what with labour relations, reps queuing up to see him, and the uncertainties of weather etc. And, secondly, there's a lot of technology involved, and a reasonable amount of science. The farmer has to go through a learning process. He is busy but he should come to grips with the concept of irrigation. He must know his farm and the soils, each individual field and each individual crop stage. With knowledge and experience come hope and excitement and, inevitably, good results. The essence of the problem tends to be, at face value, that it is all too technical. There is too much in the way of apparatus and methods that he has never been exposed to before. I don't think more than 2% of the farmers practice scheduling and scientific water management.

* I rely on the advice of an agricultural consultant from Van der Kloof, who visits me every week or two weeks and discusses with me how much water should be applied at the next irrigations. He checks on the irrigation applications since his last visit and, using an acetylene bomb, measures the soil moisture content. This is a free service provided as part of a fertiliser company's normal marketing operation but is likely to be discontinued in the future because the consultant has other duties and the irrigation counselling is now taking too much of his time.

* The information is available but the extension officers do not have the time to visit the farmers and discuss their problems. It doesn't work to go to a farmer and tell him he has a problem, you must wait till he comes to you. One of our farmers who knows us and what we offer well, has gone bankrupt because of his irrigation. He has the best equipment but a yield of only 2.5 to 3 tons. We found that all his practices were sound — even his total water application was good. All we had to do was to sort out his irrigation distribution and this pushed his yield up to 5.5 tons/ha. They know we are here but they don't use us.

* I agree that farmers look for methods which simplify their daily management task. Remember, that makes it possible to manage a larger area, or a bigger enterprise, and that is efficiency. I agree too that irrigation is regarded as an insurance and that few farmers are willing to take a chance on under-irrigation. There is the theory that, if you make a farmer pay, be it for water or services, his attitude will change but it doesn't work out that way. With our Irrigation Board, we have made the farmers pay for everything, including the computers and still nobody really uses the system. It is a matter of awareness and education.

* At times, I feel that those chaps who still haven't grasped what it is all about should be left to do their own thing but this does not solve the problem. Our problem is that they are still not getting top yields; they are still wasting the water; they are still giving the Irrigation Board a problem so we can't take the attitude of saying, "You look after yourself. You must either be out of the scheme or in the scheme." The fellow who is not going to go along with the scheme is a total waste of time until you can teach him. Teaching motivates, because if you don't know, you don't know you are doing something wrong.

* You know it all goes even deeper than the things that we have been talking about. It is not good enough our saying that the farmer is not doing it, the farmer doesn't know he has a problem until someone finds out what is restricting him. Twenty years ago, no one grew maize on the red soils until aluminium toxicity was identified.

* I would say that the root cause is that many farmers are under-qualified. He knows he is under-qualified. He's frightened of technology. He is fiercely proud. So he will tend to shy away from advice for fear of showing up his weakness. I think it is as simple as that. There are few people in this world who are able to admit their lack of knowledge, whatever walks of life you may be in, and I think it is a very rare person who will accept his limitations and draw from another's circumstances. So, even if a farmer, feeling himself to be under-qualified wants to call on the services of extension staff to help him, there might be a kind of defensiveness on the farmer's side.

* There is nothing to beat personal extension. Back in 1980, when the Department came here to teach us to grow maize, they did surveys here, they did trials here, and the extension officers were with the farmers setting it up, getting them taught how to sort their planters out, the reason why you should have good spacing, plant populations, seed beds, seed, the right sequence etc. — but it was all done by personal contact.

* The farmers that were involved with Professor Bennies' research at Ramah, and still farm there, understand irrigation and have peace of mind. They are fully trained. How did this come about? It was not planned! It was simply that, every day or two, they came and had a look at what was going on with the research. Then they used the experimental plot data to irrigate the whole farm.

* Before the 1979 drought, we didn't know where we stood with our water situation until the Department of Water Affairs notified us that we had used our quota. Dr Streutker with his research made us aware of crop water requirements and scheduling. We are now in a position to estimate how much water is required on each plot and where we stand with scheduling.

* Looking back over 15 years with Dr Mottram, who is a very practical scientist, our problem is to get all that research that has been done used by the farmers. It is a matter of motivation. How do you get the message across? I think we have more than enough research but we do not know how to get it applied in practice. He has got the facts of irrigation over to the 12 participants in the experiments, but now to get this over to the community in general is the challenge.

2.4 Irrigation systems and their management.

* When we came to this farm, it was flood irrigated and it was a terrific job getting around, especially in December, January, February, and March. You could never get around quickly enough, and we used to get washed-out crops of cane, suffering from stress. And the only way to be more efficient was to go to overhead irrigation.

* We started with flood irrigation which, on some soils, worked very well but there were some lands that should never have been flooded because they were too steep. We then went to sprinkler irrigation and that served us very well but then, with modernisation, we went to drip irrigation.

* With the old system, each sprayline had to be physically carried by hand twice a day, which required manpower. With the dragline system, it's just a sprinkler that has to be moved because the hosepipe, the dragline, remains in place. So you just move the sprinkler along. So each labour unit can handle that much more in a day. It could make the whole system more efficient. This really only works on the cane because, in the vegetable crops, you have got all these hosepipes that are dragged across the crop and do quite a lot of damage.

* An adequate knowledge of soil profiles was essential to dealing with the problem of drainage. Underlying clay banks were a common cause of drainage problems in the cane fields. To combat this, cambered beds have been introduced, on the advice of the Sugar Experiment Station. This has resulted in a dramatic improvement in productivity levels on the poor soils.

* Pivots were something completely new when they first started and they listened to the salesmen. The salesmen didn't know too much about it themselves and, every now and again, went over to the USA to find out more about it all! The pivots left much to be desired. Originally, I had a pivot that was moved to three positions. The capacity was 63 l/sec and the run-off was serious. I dropped two towers off and was left with 5 towers taking 28 l/sec and even then there was still run-off. The soil has a very fine structure and low infiltration rate. I used to do 2½ circles with the same pivot. Now there are two pivots which are not moved, while the half-circle is used for vineyard under drip. The soil now has a better chance to cope with the water.

* The idea of using 90–120 ha half-circle pivots is being advocated by some farmers. I have no quarrel with this and agree that, if you have enough land, this is an ideal way of irrigating. It is no better than individual 30–40 ha pivots but it is more economical. You eliminate catch crops and you can go for a good maize crop after wheat. If you have enough land and three or four pivots, you go for full circles and leave one or more of them

out and you see to it that your capacities are right. Doing part circles causes all sorts of operational problems. The run-off problem is about the same on a 30-hectare circle as it would be on a 120-ha one at half application rate.

* We've got microjets there. We start off young trees with basin irrigation because we find that the root system is still concentrated near the tree. We've already got underground laterals. So we just use hoses from those laterals into the basins, and the intention is, when the tree is two or three years old, to convert to microjet. To pay for a microjet scheme before you are getting any returns from the citrus is quite expensive. So, if you can wait for three years, you might be getting half the cost from the crop.

* The really significant decision made regarding enterprise mix was to shift my primary emphasis from cane to citrus. This decision required substantial adjustments to the irrigation system. The cane was on drag lines with overhead sprinklers. Various systems were used for the citrus. Some was on microjets, some on basins and some on under-tree sprinklers. A gut feel guided the decision to go for lateral lines with under-tree sprinklers on the projected new 30 hectares of citrus. I felt a definite antipathy to the micro irrigation which I had put in ten years before. I did not believe that it was the right system for citrus, despite the capacity to control water flow accurately and avoid water wastage.

  We did it slowly. We did one section at a time. As a farmer, you don't know the quality of fittings: in one case, they supplied grommets instead of a T-piece with proper clamps for take-off lines. Very often the farmer takes the lower priced lower specification product in ignorance. The farmer should go into matters further. It's better to pay more and have a scheme that will last 20 years and not have the hassles of having to open up trenches. Same thing with gate valves. Mind you, so much depends on how much money you have in your pocket at the time! I had one bad experience but it was partly my fault: I told them I wanted to spend X amount!.

* Yes, he has been a supplier for some time and he knows the area very well. I'll consult him on the design side and talk about how we would like to do it. He will give his ideas and I will give my ideas and, hopefully, they are similar. He has done a plan of the whole farm as I required. It seems to work quite well because it is my master plan, and we can plan the timing.

* I purchased new equipment from a person that I had dealt with for some time. I prefer to purchase where I have set up some sort of rapport with the supplier. I am not interested in shopping around and buying on quotations, except in instances where I feel that I have been misled or overcharged. I feel that the suppliers of irrigation equipment are offering a reasonable service. If a supplier sells inferior and/or inappropriately designed equipment to a farmer in the area, he would do no further business in the valley because the word would get around at farmer's meetings and discussions.

* Infiltration is a factor. On my top circle, I have "kalk" soil and the slopes tend to be rather more than I would like so that I find that I can only give 12 mm at an irrigation if I am to avoid run-off. The balance of my soils are deep and sandy, where I can manage to apply 20 mm at an application, but I would never really go much beyond that. One problem on the sandy soils is that, when crops such as groundnuts are planted in rows, it takes some time for groundcover to develop and a crusting problem develops and, here again, you find

that you get run-off. My pivots have a capacity of 10 and 11 mm per day gross. If I have to give 45 to 50 mm in a week, then I plan three irrigations of 15 mm. At times, however, it may be necessary to irrigate more frequently. Where possible, I start a crop on a full profile but this is not always possible with maize following wheat, where there is a rush at planting. It is always possible to start wheat with a full profile. During the last season, I had early maize when there was the extreme heat in January but there was no problem and, having started with the full profile, I find it difficult to believe that a plant can suffer damage when there is adequate water in the horizon. Of course, in the middle of the day, the crop will wilt but this would not cause permanent damage.

* Scheduling on farms with pivots is largely determined by the design of the system. They still don't appreciate the implications of starting off with a wet or a dry profile. They haven't grasped that you can use the reserve capacity of the pivot early in the season to build up the soil moisture in the profile and reduce the peaks later.

* I recognise that, with careful management, very good use can be made of the 100 mm stored in the soil. I feel that this should be used before I purchase any additional water. Farmers in the area have a great fear of running short of water. This has partly come about because of the infiltration problems and the fact that we are limited in the amount of water that we can apply. There are also considerable breakdowns, particularly with pivot gearboxes. Breakdowns can have a serious effect on scheduling at the height of the season.

2.5 Scheduling and scheduling techniques

* The vine is a weed. I use the A-pan and read it once a week. Tensiometers don't work in stony soils because the variation is too great. It drives one nuts! There is an American graph provided with the A-pan which seems to work well enough and gives cubic meters of water. The distribution throughout the season is determined by the A-pan and visual judgement.

* The bailiff comes along to you and asks your planting date, say, for wheat: the fifth of June. He takes that date and your area and passes that through to Roy, who gives you the figure back once a week that your crop is now 40 days old, this is the water usage of the crop, so just apply 7 mm per day during the next week. So the farmer has to do absolutely nothing. A return is provided for each land. It is related to the water holding capacity of the soil and the computer handles it.

* We base our scheduling on the A-pan and I use one installed on a neighbouring farm. This year we determined the actual root zones and I have replaced my spitters to include the clovers between the rows and to fit in with the scheduling.

* The estimate of crop water requirements presents few problems since the introduction of BEWAB. I soon stopped using the A-pan and found the standard crop factors to be far out.

* Mr W. used scheduling aids for his citrus operation (he had tensiometers on all the strategic soil types), but was less careful with the cane operation, where he was working on historical figures because his A-pan system had "unfortunately got a bit defunct".

* I find BEWAB to be a very good practical guide for irrigation management. I know my lands and where to go for a high yield and do a printout for each land, aiming for a yield of 7.5 tons for wheat, 12 tons for early maize, and 10 tons for late maize. I check out the profile with an auger every two or three weeks and I am under the impression that, in the case of wheat, BEWAB tends to underestimate requirements early in the season. I know how much irrigation water I give each week and write it down. In addition, every Sunday afternoon, I check how much water has been delivered from the irrigation system, where I have catch cans in position. I may not be saving a great deal of water at this stage but I undoubtedly have peace of mind because I understand what is happening and have well above average yields.

* You will see on this example that, over a seven-day period, the tensiometer reading at the end of the period is the same as at the start so that the irrigation water applied is equal to the water used by the crop, plus all losses such as weeds, evaporation and percolation. This enables me to calculate a crop factor for the period; in this case, it is 0.9. I then use this actual crop factor to project the irrigation application for the next three days. In this case, 18mm. If the maize is small, you know the root depths and that, next week, they will be deeper. These values are available. It is then possible to work out the amount of water needed to wet the additional depth occupied by the roots and this is added to the requirement calculated using the crop factor. In this way, I always keep pace with root requirements and do not have to bring the soil up to field capacity before planting. As the roots go down, the soil is kept wet just to the right depth. This means that, if 50 mm of rain falls, nothing is wasted, it just builds up the soil water reserves.

* My neighbour will have different crop factors because his whole way of production will have an influence. From season to season and from day to day, the crop factors differ. The standardised, normally accepted crop factors are way out.

* I obtained advice on irrigating fruit, installed micro, and utilised tensiometers and the Scheepers pan but found that the official recommendation of 700 mm was too much and cut back to 400 mm. This is in line with the experience of other farmers.

* The situation on my home farm is unique in that the lands are level. Presently, cycle time is from 2½ to 3½ days, aiming at four. I am not keen to go to as long as a week. I believe in keeping the water content of the top 600 mm high, in order to maintain optimum growing conditions. I do not rely on subsoil moisture but feel that, with the tough conditions of the past season, this is what saw me through.

* The schemes designed and installed by my father were flood systems. The disadvantage of these systems was that it was impossible to take account of the great variety of soil types occurring in close proximity to each other. Currently, each system was designed for a specific set of circumstances. There could be no logic in a massive scheme that covered a huge area. Whereas, in the past, it would have seemed perfectly acceptable to "just jog along", now, a trained irrigation engineer would be called in to advise, proper soil samples would be taken, and crop factors and climate would be considered.

* ESCOM is doing a good job. It is good, they are helpful, and they brought in these off-peak rates in order to assist the farmers but it is difficult to adapt your irrigation system to fit in with the off-peak periods. When you irrigate you have specific irrigation cycles and stand

times. In the old days, we used to irrigate cane at night and have an eight-hour stand but there is no other crop we grow that can stand that amount of water. You cannot do it on pastures because you don't want the water to penetrate further down than 300 mm. If you let the water go down to 600 mm, you are wasting an enormous amount of fuel and apply an excessive amount of water, because that is more than the depth to which the pasture crop roots grow. To adapt stand times and irrigation frequencies to be able to fit in with the new rates can be an extremely difficult and expensive matter.

3 THE FARMER AND HIS HOUSEHOLD

3.1 Reasons for farming

* I realised that I should acquire more land, develop it and pay it off by the time I was 45 and I still had my health and drive. You must set yourself a goal.

* I enjoy farming. I like living in the country, and feel an aversion to urban life. I do not even really enjoy occasional visits to the family beach cottage because it is too "towny". The Durban flat where my children live is utterly unattractive to me. I can hardly tolerate sleeping there, even for one night. I have "parked" on the farm, and there I intend to stay. For me, farming has no negative aspects, although I do experience farming as a constant challenge. The human and political problems loom particularly large, but anticipated difficulties in these spheres would not influence me to change my way of life. My observations of farming in other countries have left me with a degree of regret that I could not be more self-sufficient. I like the idea of waking up in the morning, starting my tractor, and doing all my own farming.

* People farm to be independent, to have a reasonable standard of living and to own an appreciating asset. In my case, I have bought shares, leaving it to informed advisors. I was not scared to spend half my profits on concrete furrows and the other on De Beers!

* I have a happy life here, I am not tied down to a desk all day and, at the end of the month, I can pay my accounts.

* I want my children to have a profession, then they can come and farm if they want to. If I had my time over again, I would have gone for engineering or something similar. I enjoy farming and the independence and the work itself but it is difficult to do sums and know where you are going. Once upon a time, it was the appreciating asset that counted but now it is difficult to sell a property.

* I would say farming is possibly the most fulfilling business that one could ever become involved in. It is a highly stimulating environment in which you live. You have a very broad range of activities. So you are very secure in terms of your activities. And there is continuity in seeing the development of a crop from embryonic stage to its maturity. On the one hand, it is very fulfilling; on the other hand, it is stressful. There are elements which are totally unpredictable.

3.2 Background and training

* When I went into Standard 6, my father gave me a morgen under flood irrigation and planted it with groundnuts at his expense. With my share of the profit, I started farming. At school, I experimented with fertiliser, crop rotations and double cropping. It was wonderful stimulation; I did everything myself, made mistakes — and became hooked on farming.

* My father died quite suddenly and, in the absence of any alternative, I took over the farm immediately. Being brought up on a farm, and then working the land with my father, were crucial to the development of the capacities required for farming. However, I regret not having any formal education in farming and feel that people fortunate enough to have formal agricultural training do have an perceptible advantage with regard to their understanding of technical issues.

* Technically, a great deal of advice is available and, if you are selective in using this advice, and fit it into your environment, and get on with farming soundly, there should be few problems. I didn't find it very difficult to learn farming but I am always very grateful for the practical business experience that I gained over the years before I went farming. At this stage, I am obviously phasing out of the business, setting up an organisation that will enable the next generation to be successful.

* I don't think it is essential to have a formal agricultural education but you must have the aptitude and the urge to farm. It helps if you are mature, 30 or so, and have done some course which has taught you to think. All you need then is the right mentor and facilities!

3.3 Career stage and change

* My attitude to decision-making and the business has definitely changed over the years. Now we have achieved something and we are not prepared to put it at stake. When you are young, you don't have much to lose and, if things go wrong, you start again.

* Sadly, even amongst the larger farmers visited, there were some that had been leaders ten years ago but were no longer "with it". They still worked hard but the world around them had changed. Some of these farmers were bitter and negative. There were others who undoubtedly knew it all but were impractical and did not have the organisational ability "to get things done". One farmer, who had better remain nameless, commented that "A man who has had a job in business or industry makes a good farmer, at least he is used to doing a full day's work!"

* There is a wide range of farm size and sophistication. However, the bulk of farmers are still small farmers and 60 % of the irrigation is flood. The small farmers are trapped by their size. The farm cannot support a retired father and an active son so that the older men hang on and there is frustration among the sons. Financially and intellectually, there is little opportunity for innovation.

3.4 The role of the wife

* She will continue with the administrative work she is already doing and, in addition, will operate the new computer package. This will extend and deepen her role in enterprise management, a role already very substantial in the nitty-gritty business of practical daily management, since she runs the packhouse for four months of the year, with a group of graders and a group of packers.

* My wife has a degree in agriculture, specialising in animal husbandry and, although she is now largely occupied with our young family, takes a keen interest in the farming activities. In addition to assisting with record-keeping, she plays a part in the general management of the farm.

* I would say it's very difficult for a farmer's wife to generate income from other sources, unless she lives close to employment places. If a farmer's wife has young children, I believe it is not possible for that woman to do another work because she doesn't have the time. She just thinks of getting the kids to school; she travels to and fro. So I think there is a very little chance of a woman with young children's doing a job, without the children suffering. But, on the other hand, if she has not got those responsibilities, then I think it is a good idea.

* My wife plays an important part in the farming — she claims she is the boss — but I do usually listen to her advice. She does the books. The young chap on the farm who is my assistant has a diploma and his wife is a teacher. His wife runs the PC but, now, we have someone doing the books and concentrate on seeing to it that he gets fed the right information. Staff wages are on the computer.

3.5 *The farm enterprise*

* I feel that my approach to farming has not changed with the years but I have changed the farm as a consequence of the labour situation. I put in pivots and dropped tobacco and concentrated on wheat and soya, which are not labour-intensive.

* The canal was put in as a government scheme and took forty years to pay off. The canal still operates and the farmers in the area have looked at ways of upgrading it. With the advent of electricity, it was possible to cultivate the land above the canal, thus substantially increasing the area of land under irrigation in the valley.

* I came into the farm in about 1958 and I worked for my dad for a couple of years. I think it was 1960 when I took over on my own account. In those days, we just did a little bit of irrigation straight from the river; I think we probably irrigated maybe 30 acres in total. We were pioneers in electric pumping in this area; up until then people used tractors. We thought we were quite advanced, having electricity pumping water. I bought the adjoining farm in 1962/63 and I bought another adjoining piece in 1977. The irrigation has just grown from there over the years. At this stage, we've got about 250 hectares under irrigation.

* My main constraint is that my farm is relatively low-lying near the river and therefore subject to cold, which makes it marginal for cotton or for citrus and even, at times, can have an adverse effect on wheat. It is my belief that my yields are not as high as I would like them to be as a consequence of climatic factors.

* I have two brothers and they follow different practices. One also has good soils, or at least level ground, lands that can be effectively supervised, and he is doing well and achieves good yields and his head is well above water. The other one has difficult soils and a farm with a broken topography. You find a 17-ha pivot, with ridges and, between them, a set of hand lines, then, 2 km further on, a 20-ha pivot. He cannot see any of the lands from the house. Operating costs are high and there are places that require 6 bar pressure. He was one of the last to come and he has a high debt and he is battling. Then, too, his soils are somewhat different so he would be getting slightly lower yields all round. He has steeper slopes, run off, and shallow soils.

4. MANAGEMENT STYLE

4.1 Day-to-day decisions

* I consider decision-making to be an important factor on the scheme. You have to make quick decisions: if you have twenty labourers and the plan was to do something early the next morning but then it rains, the land is too muddy, so that quick alternative plans must be made.

* If you want to be an irrigation farmer, there are a lot of things that you don't do that other people can do: you don't move away from that farm; you have got to be prepared to be at it all the time, not necessarily to do physical work, but to show your face and to check up on what is happening. Maintenance has got to be good: you must keep a constant check on the pivots.

* To keep head above water, you must be on the farm — gadding about is one of the main reasons for failure. You cannot leave a R105 000 crop to the mercy of the labour. Farmers do it and blame failures on the labour. This year, a farmer made the mistake of taking seven days' holiday when the irrigation demand was high and, while the labour followed instructions, there was a very hot spell to which the farmer would have reacted but the labourers didn't put down enough water to keep pace. When he got back, he tried to catch up but it was not easy.

* Citrus farming demands dedicated management from January to January: management of moisture content, irrigation applications, fertiliser and spraying programmes, to mention but a few.

4.2 Future planning

* Planning ahead: I have a serious "uintjie" problem. I must find a crop that will fit in with wheat and that will make it possible to hit the "uintjies". That land must be clear in January so that I can do a good job of ploughing and prepare for a good wheat harvest.

* Every block has a number, cotton blocks 1 and 4. I know that, where I plant cotton, I can't plant wheat; where I plant sunflower, I'll be able to plant wheat. That takes care of next seasons' planning.

* I approach planning by keeping informed, by talking to extension and commercial people and fellow farmers. **I write these discussions up and write memos to myself, which I use in next year's planning!**

* I am not much of a long-term planner; I find it hard to stretch my imagination to that extent. What sort of assumptions does one work on? We do an annual plan with an eye on the following year because you must take rotations into account. I don't have a long-term plan, such as that I intend to buy new land in five years' time.

* I don't sit down and do formal future planning in writing. **I do a great deal of planning but it is in my head.** I try to read the market and the weather in order to decide whether I should plant 80 or 120 hectares of wheat, or if I should go for 60 ha early maize instead of wheat.

* In terms of long-term planning, I rely on the co-op and their advice given at the annual Farmers' Day. This applies, not only to crop selections, but also to practices and target yields.

4.3 Computers

* Family members are training themselves in the use of a recently acquired second-hand personal computer, purchased because we recognised that our record-keeping was not up to what it should be. Mr J's wife, who was always been responsible for the office work, is taking the primary responsibility for computerisation. She has got herself fairly au fait with the machine, and uses it to do the wages, a substantial task in a enterprise employing two hundred units. **A new farm management package designed by a local consultant has just been purchased.**

* We have been doing our accounts on a PC for the past year and use the PC as an aid in scheduling, with the help of BEWAB. I try to be precise and I know, at the end of the season, how much water I have given. **I find it difficult to understand why more farmers do not adopt this approach.**

* I regard my detailed record-keeping and management as being one of my strong points. I started using a PC in 1986 and work with it myself. I use it for accounting purposes and then, with the help of a spreadsheet, keep a record of my water use. I have not yet used the PC to extend my BEWAB programme, which I run on the computer. One of the difficulties is that farmers just do not have the time to be able to play around with the computer and to program spreadsheets and to develop their own programmes. **I put this down to the fact that they are concerned with day to day, hour to hour supervision in the lands.** If there was a really suitable user-friendly spreadsheet type programme available for water management, I would undoubtedly use it. There are specialized programmes available for other aspects of farming and I believe that there will be one for water.

* It has become the in-thing for farmers to acquire some sort of computer system. The constraint is actually becoming computer literate with the programmes that are feasible. There are programmes that are far too complex. **There is a very pressing need for farmers to have simplified computer programmes that provide information rather than data.** In other words, the data they are capturing must give them information they can act on, rather than a so-called data base.

* I am a very precise person and keep all the farm records manually personally. In time, I may use the computer for technical record-keeping. I understand that there are programmes for assisting wine makers.

* I'm on one of the computerised systems. It is called Cane Farms, and your cheques are coded. It is all done on the computer. You get a monthly report and, at the end of the year, you get a final report, with all your orders listed. That I hand to my accountant, who then draws up the balance sheet and does the rest from there.

4.4 *Corporate management*

* Farming is not just a straightforward operation. There is financial planning. There is planning of crops. There is maintenance of equipment. There is labour relations. Everything depends on one person whereas, in industry, you have one manager for each department. So one farmer can become a little bit overloaded. And then you get involved in committees and things like that. It takes time. And then you have additional things, like the JSB's, the VAT's, and so on.

* There is a clear demarcation of management responsibility between father and son. The son is entirely responsible for the field side of the citrus operation. This involves fertilizing, spraying and irrigation management.

* To manage the cane side of the enterprise, Mr Z. employs an Indian manager who "virtually has a free run, and runs the whole thing from the crack of dawn to whenever" and who is responsible only to Mr Z. The cane manager has a minor responsibility to Mrs W., in that he has to supply her with facts and figures on a daily basis.

* I am 37 and left university to help my father, who had health problems, in 1973. My wife is active in the administration but there is a full time secretary. The herd is run by a 30-year-old graduate and there are three young managers handling the potato side. An agricultural economist visits the farm each month as a consultant and assists with financial and production planning and management.

* **Management responsibility is shared on the basis of enterprises that can be identified as financial entities.** One brother is responsible for the cellar, deciduous fruit and administration and the other for the vineyards and personnel administration. Accounts are kept by a bureau but cash flow projections are done on our PC, other planning is done on the physical farm plan, which has proved to be very valuable. The PC is now coming into use in management. Initially, it was only used for wages but a consultant is now helping us to get labour hours onto the PC and we believe it can be used for mechanisation, etc.

4.5 Realistic limitations

* I think, over the years, I have gained a feel for farming. Whether it has been a good one or not I don't know. I think a lot of farming is really a feel and experience. You know, people sometimes ask why you do a thing in a certain way, and you don't know why you do it. You have forgotten why you did it that way. But we'll see, in future, maybe we are going to have to try and become a bit more technical.

* You see, the other thing that is interesting is that, up until just a couple of months ago, I have been on my own on the farm, running the farm myself. I have done things to fit in with what I felt I have been able to achieve, you know, within my capabilities. But things may change now, with my son coming onto the farm.

* I recognise the merits of highly efficient, high input management but decided to adopt a level which suits my personality and is effective enough, while falling short of the top achievers.

* Some have higher yields; one member, in particular, combines exceptionally high yields with very good quality, but he spends a great deal of time managing the leaf area. He takes out the bottom leaves in order to get better aeration, etc. and this costs money and needs well-trained labour.

* Up until now, I have been doing what I have done for some time. To me, there didn't seem to be much point in overloading myself to try and go for maximum production. It might sound like a lazy way of doing things, but one has one's limits.

5. MARKETS AND CROPS

5.1 Shift to export and high-value crops

* Citrus has become twice as important as cane, from a financial point of view. However, citrus requires twice the investment and therefore entails a far higher level of risk. The irrigation system is far more expensive and, although fertilising costs are less, additional inputs like insecticides are a heavy cost burden. Citrus production is a far more complicated business than cane production. In addition to the greater complexity of pest and disease control, you have to deal with the stringent demands of harvesting and packing it. In the light of all these factors, the decision was to round the cane off at 17 000 tons, allowing a bit of leeway, and shift into citrus on the land made available. The transition would be self-financed. The A-Pool cane (which guarantees a degree of financial stability) will be maintained through intensified production on less land.

* The guaranteed market for A-Pool cane contrasted with the more volatile export market for citrus. The Nkwalini Valley is a grapefruit area and grapefruit production necessarily means targeting export markets.

* We must always remember we are part of the world. It is cheaper to send a box of wine to London or New York than to Jo'burg. We must concentrate on the products we can produce better and there will always be the chance for the man who can produce the

special thing. Because people have money in their pockets, they go for luxuries, such as tomatoes, and the price levels enable us to do things properly. Most farmers need a cash crop of this nature to keep things going and, if we can maintain quality, we should do well.

* The cost of transporting the sugar 80 km is proving a difficulty. There are farmers that are going out of business because they are under considerable financial strain. In addition, matters have been aggravated in the entire valley because of the hormone problem. It is only in the last ten years that this area has been a really intensive vegetable farming area because it was then that the cane farmers sold up, subdivided their farms, and the intensive vegetable farmers came in, especially the people growing tomatoes, cucumbers and the other delicate types of crops. Cabbages have a very waxy leaf and can stand much more than other vegetables.

* Brits farmers are diversifying. Moves have been made to supplement wheat and soya with paprika and peppers that can provide stability with reasonable profitability. Onions and other vegetables can provide high profits but are speculative. "Tobacco made me rich, vegetables are making me poor". Farmers are looking to permanent crops such as citrus and vineyard for long term stability and reduced electricity costs. Farmers who have had to go out of tobacco are still looking for substitutes.

* We supply the citrus co-operative's juicing plant. The price is good and they collect the fruit on the farm so there are no worries about packing.

5.2 Alternative crops — weighing the alternatives

* The practice used to be to produce a full circle of wheat, followed by a half-circle of maize, but economic circumstances have led to farmers' attempting to make 200% use of the area under the pivots by going for a catch crop of early maize, soya or groundnuts. Wheat is profitable, if an average of 6,5 tons can be maintained, and an economic yield of 9 tons per hectare with late maize is also profitable. The crop combination is profitable at present prices, although farmers would like to see higher prices. I myself have managed to get up to 10 tons of late maize and, in a very good year, 7 tons of wheat, which are well above average yields. Although the profit is not as high as might be desired, there is a feeling amongst most farmers today that it is safer to stay with the crops one knows but, over the past two years, I managed between 4 and 4,5 tons per hectare with groundnuts. I tried cotton but the climate is rather on the cool side for cotton and production can be severely handicapped. Last year, the wheat looked very good but there was too much rain and, in the end, yields were well down. I have grown potatoes but have now run out of potato ground because it is only possible to grow potatoes on one-fifth of the land. I have planted popcorn two years in succession and have got good prices.

* We are looking for alternative crops. My neighbour has gone for vegetables but we are too far from the main markets to make this viable and we need local processing to make it worthwhile. Our present choice is maize, potatoes, groundnuts and wheat with, here and there, some soya. Potatoes grown on contract for people like Simba have been profitable but there is no way that 150 farmers can participate. It is the people who had the original contracts that are well away. Sometimes a farmer bought a plot because he had a contract. There is a move to sell off marginal plots so as to provide more water for the better ones

because the dams cannot store more water, and there is no place for another dam. It is difficult for an irrigation farmer to compete with the dryland farmer in a good year.

* We grow vegetables, mainly cabbages at this stage, but we are looking at other crops as well now. Tomatoes, a few butternut, squash, green mealies, you know. We want to see how that fits in. We've been doing cane and cabbages, and it's working very well from a labour requirement point of view. We might have a problem with labour requirements and there might be a clash. We might need to bring in more labour but, hopefully, not.

* We tried groundnuts and dry beans but one wonders if it is worthwhile. We know maize and wheat: you plant, fertilise and irrigate, and a contractor takes care of the harvesting. It takes three years to get to know these other crops, and management is much more complex.

* We have managed cotton at 4 ton/ha over the past two years but, with the decline in prices, have decided to adopt a wait-and-see attitude. Popcorn has came to the fore recently a short-season (120-days) variety. It will have a yield of 6 to 7 tons but the price more than compensates for the lower yield. We have looked at all sorts of possibilities over the past three years. There are some farmers who have opted for a policy of concentrating on wheat and maize but all are concerned with the financial situation. Cotton caused great financial loss when low temperatures caused low yields. Groundnuts, with the new varieties can be a proposition but we have decided to leave groundnuts until there are no other options open. There are the problems of labour for harvesting and the fact that groundnuts can only be planted once on a land. We do plant potatoes, up to 20 to 25 hectare per annum, and accept the high labour requirement. If groundnuts were added, there would be an intensive demand for labour from April through to mid-August, just too much. They cannot really come back to a land that has been planted to potatoes a second time; the pH of the soil is too high. We still have enough land available for two years of potatoes and we will then evaluate the position. There are new remedies on the market. Popcorn is currently the best proposition but, last season, "Painted lady" beans proved very successful, although the market is too small, only 2 000—3 000 tons in total.

* Cotton, wheat and late maize, that was the traditional pattern. We are now busy changing to an early maize variety instead of cotton. At this stage, we cannot rely on groundnuts as a crop in the rotation because they do not have a disease-resistant variety. Harts is so quick that we can use it as a catch crop but it has not the yield potential to use as an early crop so, without cotton, we have a problem but have every hope that, from 1995, there will be a suitable groundnut variety available.

5.3 Dangers

* By concentrating on wheat and maize and striving for 200% occupation, we are breaking the sustainability rules.

* There is a tendency to plant wheat earlier, in August, when the days left until December are less than if you plant in June, and this throws my BEWAB calculations out. There are dangers in going for late planted wheat and for going for the full occupation of the land, year in and year out.

* I wonder if the relatively moderate yields achieved with wheat are because there is not a suitable rotation. This idea is supported by the high yields that we have achieved when wheat was planted after garlic. On a 5-hectare block, the wheat yield was up to 9 tons per hectare and onions following on after garlic had a very much improved yield.

* Planting the long maize cultivars has worked for the past six years because we have not had serious frost. You could be caught but you would still be caught with the normal late cultivar — the range is 9 to 6 tons/ha but, with the new approach, it is 12 to 6 tons/ha. It is useless to go for the short varieties. The whole approach has changed. Now there are short-season wheat varieties which can be planted in August, which can yield 6½ to 7 tons/ha. This allows the maize crop time to mature and dry.

* The big danger is cold at flowering. Warm springs do not appear to be a snag because irrigation frequency is not limited to every two weeks, as it is with flood at Vaalharts. We irrigate about every third day. My pivots vary between 6 and 9 tons/hectare.

* When the disease problems with the wheat became serious, I went to the OFS University and discussed my rotation with them: two years' groundnuts, followed by wheat, and then something else and then, the fourth or fifth year, groundnuts. They asked me what the yield was and, when they heard that it was 3 tons, they said this was another ball game. Evidently there was some relationship between the organisms in the soil that caused the disease and the high groundnut yields.

6. FINANCIAL MANAGEMENT

6.1 Borrowing policy

* When I bought land in the past, I paid half cash but I bought because I owed no money on the rest of the farm. I believe that you dare not borrow more than half of your capital.

* I am working entirely on borrowed capital. Liabilities are about R4 000 per hectare, which includes the pivots. I believe this to be reasonable. I am luckier than most, in that I didn't have to buy tractors. Interest payments are about R10 000 per month.

* I haven't actually raised loans for expansion at all, and neither have I negotiated overdrafts specifically for that purpose. And I haven't always waited until I have been able to put the money aside. I have done it as and when I needed to do it, provided, of course, I had funds to do it. I have tried to keep it within my own financial limits.

* I am busy with planning now but I remain conservative. I know my costs and I know what I am making and we are operating on 16:1 ratio of own to borrowed capital. The economists say this is far too conservative but I am not prepared to expand my business to the extent that I get myself into trouble. If things improve, we may expand. I have a chap who has worked for me for a number of years now and I would like to help him to get land of his own.

* I am only prepared to commit myself to debt that can be redeemed in a year. I don't believe in debt. I have had considerable debt in my time but this has always been with the

knowledge that it could be paid off within a year.

6.2 Appreciation and depreciation

* Farming remains a good way of life, provided the financial position is reasonable. Farming is less attractive now than it was ten years ago. What worries me now is that I have devoted my whole life to farming and all my assets are in farming and if, for any reason, I decide that I should retire, it will be almost impossible to find a buyer.

* There is no guarantee. My return on capital investment is far greater than that of somebody who started a year ago. So maybe I'm surviving on capital appreciation. At what stage that runs out, I don't know.

* While we have had their financial ups and downs, including the debacle of the cotton, we are now in a position where we believe that, by the end of the last season, we will have cleared all overdraft and all debt except for half the purchase price on two combines. Inflation has, however, played a great role in our success. We got in early and were able to let inflation do the job for us. I am convinced that the bigger farmers are going to go on getting bigger and the smaller farmers are going to find it more and more difficult.

6.3 Input costs and cash flow

* The only way to increase confidence in farming is to reduce input costs. Risk has just become too great. I owe nothing at the start of a season but, when I deliver the crop, I find I owe the co-op R200 000 and the bank R150 000 so that, in total, with the crop, I have built up a debt of R350 000. Now, what happens if I have a crop failure?

* I regard the climatic conditions, in the area where I am, as being marginal. It is not a winter rainfall area but rains tend to come in the autumn and cold comes early. Generally speaking, it would be desirable to follow a rotation with cash crops, where three crops are produced in two years, but the difficulty is that few farmers can manage to carry the finance for this six- to eight-month period, when there is not a crop under the irrigation system. The financial circumstances are such that a few farmers can manage this and that is why there is a continuous search for stabilising crops. The position will vary greatly from one farmer to another, depending on his physical and financial circumstances.

* Inflation only caught us on replacements and on transport. So, theoretically speaking, we should be around when quite a few other people have gone under.

* Personally, I try to be positive. I am not growing the most profitable crops and I concentrate on keeping a close rein on costs. The interest rate is the major problem: it is just getting completely out of hand. One is forced to borrow some working capital but one must limit it as far as possible and not try to keep up with the neighbours.

* Many factors need to be considered, when drought strategies are developed. No farmer can be confident of surviving a serious drought situation but the larger diversified farmer has the option of being able to eliminate the less profitable enterprise or cultivate less land and still

cover overheads. The average farmer does not have these options. Many farmers have access to additional water sources, such as boreholes and their dams, but one wonders if their management of these assets justifies their evident optimism.

6.4 Development and diversification

* I put in an irrigation system and started to get yields up. Grew until I could buy more land with half the capital coming out of profits. Repeated the process, each time buying completely undeveloped land. In retrospect, I wonder if this was really the best policy.

* Cash flow is presenting something of a problem. Perhaps I have expanded too much. A few harvests that are not up to standard, and cash becomes tight, nothing critical, but one feels uneasy.

* It was unnecessary to bond in order to purchase the third unit, which came onto the market at a very reasonable price. In contrast, the second farm was acquired at a very inflated price (twice the market value), because the sellers were aware that we were extremely anxious to consolidate their holding. We were prepared to pay what we perceived to be an inflated price, balancing this factor against the advantages of consolidation.

* At the moment, we have about 25 ha of citrus and the balance is cane. The objective is to go out of cane and push the citrus up to between 60 and 65 hectares, mainly grapefruit but some valencias. We need the mix of grapefruit and oranges in order to spread the packing season. We are talking about 125 000 cartons of citrus at a margin of R7 000/hectare, as opposed to the margin on cane of from R1 000 to R1 500. The only trouble is that, with citrus, it takes a long time to get going. So you can't go into it too fast because of the cash flow position.

* Traditionally, this is a wine grape area but the industry has its problems as a consequence of surpluses, and a measure of diversification is obviously desirable. We experienced rough in times '84, '85, '86, when the interest rates shot up and we made mistakes in handling finance but it is now going well and we have the funds to go into fruit.

7. LABOUR

* The wage paid by Water Affairs to their labourers on the scheme is much higher than the farmers can afford. At the end of the day, the quality of the labour on the farms is just not good enough.

* I do my own training but we have been pressing the agricultural union to establish an agricultural high school in the vicinity. There is a perception amongst the labourers that wages should be related to length of service and it is difficult to get them to appreciate that the new man can strip an engine and deserves a higher salary. They work him off the farm. If I need a supervisor, I choose one of my own people and help him to become competent. Where possible, I train specialists and they support each other. One man may be able to set ploughs, another to operate a baler.

* There was a lot of fighting but this was sorted out and all the people today are top responsible people. My head stockman, head irrigation man, my foreman on the farm, they are all black people. The tractor drivers were youngsters when I came to the farm and I decided to train them. These are people who live on the farm with their families so they have been here for thirty years and, as a result, there is now a nucleus of highly responsible, competent people. My head stockman does all the inoculations, controls the clipping, does all the tagging, recording all the cows and calves. He has a pride in his job.

* I challenge anybody to find a thin man on my farm. There is no stinting on food because, if there is, naturally the labour will start to steal. The families get bags of meal, they get raisins, they get meat twice a week (and that is an expensive commodity today).

* Labour presents few problems. I have a fairly liberal outlook and I pay my labour satisfactorily. I allow them a good deal of freedom of action: they don't call me "boss", I do not beat them up or swear at them; I adopt a very relaxed attitude. Training is provided by Boskop and other organisations. I do not worry too much about them taking it easy, if matters are not very busy, but, at planting time or harvesting, it is a matter of working from Monday to Monday. I give them overtime for Saturdays and Sundays and today it costs R350 a month for the men I am hiring now. I have ten labourers and feel that labour legislation is highly desirable to stop employers taking their labour for a ride. I do not anticipate any significant problem in this regard.

* There has been a substantial change in the way that I use my two black supervisors. They have motorbikes and radios and, instead of being in relatively menial positions, as was previously the case, they are fulfilling managerial roles. The role of the black supervisors was redefined before the employment of the Indian cane manager. The redefinition came as a consequence of a recognition that the management structure was incomplete at a lower level. I conceptualised management on the farm as operating at three levels. I think of myself as upper management; the Indian cane manager and my son, I conceive of as middle management; and the black supervisors occupy the rung of lower management.

* In labour management, decentralised management rather than an autocratic model of management is very advantageous. In other words, you must create a team around you. Any manager is as good as his team allows him to be. The team needs to be well trained, it needs to be motivated, it needs to be adequately housed, and it needs to develop a sense of belonging — all the psychological needs. I think there will be problems with needs. Firstly, it is not the money, it is not the housing, it is not the food: it's the job itself that gives you a true satisfaction. Therefore, I think all the requirements of the Labour Acts are essential to successful farming.

* Labour management and motivation is becoming more and more important. We have an association concentrating on this, which is really starting to stimulate this aspect and we are discovering the potential of our labour. It was there all these years but we did not utilise it. We are starting to discover that the quality of work that we get from migrants is not good enough and even our local labour is starting to complain because they have been exposed to motivation and training and resent the performance of the migrants. There is a tremendous amount of talent amongst the labourers which has been lying dormant all these years. We have always concentrated on telling them what they must do, how they must do it, and when they must do it. We seldom told them why — but now we are pulling

them in and asking their opinions as to what should be done and they are making tremendous inputs.

* Mr W. thought it extremely important that all the people living on the farm were on amicable terms. The farm workers have a committee through which they express their views and negotiate with management - though not on wages, which Mr W. regards as a personal issue between himself and each individual worker. The committee system has only been in operation for a year, its inception being a consequence of the organising efforts of a Rural Foundation community worker.

* The trade unions are upsetting one of the few stable factors in this country. When industry has a bad time, they retrench. When the farmers have a bad time, they don't retrench because they have got to carry on. They have to see it through. They have never retrenched because of bad times. The farming community is providing stability and yet is being criticized for not paying and for not looking after their labour.

* I think it is scary because the working relationship that we've got with the workers on the farm is quite a lot different from businesses operating in town. At the moment, it works pretty well and, if you were to be able to change overnight and run this place as a factory, it would probably also work very well. But the transition from one to the other can only put us in trouble.

APPENDIX C

EXAMPLE OF TRANSCRIPT OF OPEN-ENDED SEMI-STRUCTURED TAPED INTERVIEW

NATAL FARMER

THE PURPOSE OF THIS APPENDIX IS TO ILLUSTRATE THE KIND OF INFORMATION THAT CAN BE OBTAINED DURING AN INTERVIEW. THIS INTERVIEW WAS TAPED AND TRANSCRIBED BUT SIMILAR INFORMATION CAN BE ACQUIRED DURING A CONVERSATION WHERE ONLY BRIEF NOTES ARE MADE. IT IS NOT EASY FOR A LAYMAN TO ORGANISE THE INFORMATION AND COMPILE A COHERENT REPORT WHICH CAN BE USED FOR DISCUSSION AND THE DEVELOPMENT OF ACTION PLANS. SAPFACT WAS DEVELOPED TO ASSIST THE TECHNICAL SPECIALIST WITH REPORT COMPILATION BASED ON SUCH OPEN-ENDED SEMI-STRUCTURED INTERVIEWS. CHAPTER 4 OF THE REPORT INCLUDES AN EXAMPLE OF A REPORT DEVELOPED BY A SOCIAL SCIENTIST SPECIALISING IN QUALITATIVE RESEARCH

Q: **Maybe you could start off by just saying a little bit about your own history as a farmer: how you started, how you got the farm. Did you inherit it?**

A: I came into the farm in about 1958 and I worked for my dad for a couple of years. I think it was 1960 when I took over on my own account. In those days, we just did a little bit of irrigation straight from the river. I think we probably irrigated maybe 30 acres in total. We were pioneers in electric pumping in this area; up until then, people used tractors. We thought we were quite advanced, having electricity pumping water. I bought the adjoining farm in 1962/63 and I bought another adjoining piece in 1977. The irrigation has just grown from there over the years. At this stage, we've got about 250 hectares under irrigation.

Q: **And what is the total hectarage?**

A: About 350. So there is a large percentage of the farm that is under irrigation. A lot of the irrigation needs upgrading. It has been added to over the years and it doesn't work that well any more. We are still busy with it at the moment.

Q: **So how will you go about that upgrading?**

A: We have added extra booster pumps and we are going to be putting in more underground mains. We are going to be changing from a portable type system to a dragline system, with underground buried pipes. Quite a lot of it has been upgraded but there is still quite a lot to go.

Q: **If a farmer wants to do an upgrade, what is the process of consultation? Who do you discuss it with? How do you make the decision?**

A: I would consult my irrigation supplier.

Q: **So you've got a very stable relationship with him?**

A: Yes, and he knows the area very well. I'll consult him on the design side and talk about how we'd like to do it. He'll give his ideas and I'll give my ideas and, hopefully, they are similar. He has done a plan of the whole farm as I required. It seems to work quite well because it is my master plan, and we can plan the timing.

Q: Could you tell me roughly what you've got under irrigation. Sugar?

A: Sugar, mainly. About 240 hectares of sugar. We grow vegetables, mainly cabbages, at this stage but we are looking at other crops as well now.

Q: What else are you considering?

A: Tomatoes, a few butternut, squash, green mealies, you know... We want to see how that fits in. We've been doing cane and cabbages and it's working very well from a labour requirement point of view. It just fits very nicely.

Q: These other things that you're thinking of could be a little bit of a problem from a point of view that they're more sensitive crops.

A: Yes. And we might have a problem with labour requirements and there might be a clash. We might need to bring in more labour but, hopefully, not.

Q: What I'd like to know is, can you see any productivity gains in the areas that you have upgraded? I mean, has it been worth it, financially?

A: It is very difficult to say, other than that it's labour-saving. We've probably cut the labour requirements down by two-thirds.

Q: Can you explain how the system does that; what is it that saves the labour?

A: With the old system, each sprayline had to be physically carried by hand twice a day, which required manpower. With the dragline system, it's just a sprinkler that has to be moved because the hosepipe, the dragline, remains in place. So you just move the sprinkler along. So each labour unit can handle that much more in a day. It could make the whole system more efficient. I believe some people have found a difference in the performance of the crop because the water is applied more gently. They say it's measurable; I don't know; I can't say; I have not really noticed. And yet, in some areas which are running on that system, the crops seem to do very well, the cane in particular. It really only works on the cane because, in the vegetable crops, you have got all these hosepipes that are dragged across the crop and do quite a lot of damage. So we have got a dual system working. I'd say, in those areas under the dragline system, it appears to be working better. I couldn't say whether there's a monetary gain.

Q: But there certainly is, from the point of view of management.

A: Yes.

Q: It's time saving, easier, and labour-saving.

A: And the maintenance of equipment is also a big factor. There is far less damage because you don't have to cart all these pipes around the farm on the trailer. It's a case of picking the sprinkler up and carrying it by hand and putting it down.

Q: So, to sum it up, you can't say that the gains are very visible financially but they're visible in a whole lot of other ways, from a point of view of management, maintenance and all that kind of thing.

A: Yes.

Q: So, from that point of view, it's worth going on with the whole upgrade operation.

A: I think so. I think we're going have to do it.

Q: But what this also implies though, is that you've got a commitment to cane. I mean, you're not thinking of changing your 240 hectares under cane, because this particular system suites the cane specifically.

A: I'm committed to cane at this stage but, if costs get out of hand, we might then be forced to look at an alternative. Our biggest cost problems here are transport, because we're a long way from the mill, and the other one is electricity for pumping. You know, at some stage, it might become uneconomic to irrigate cane.

Q: The difference per hectare is, instead of getting about 50 or 54 tons on dryland, you will get about 80 to 85 tons per hectare under irrigation.

A: That's right. We've got lower rainfall here than the dryland farmers just over the hill. So, for us, it would be a risky business without irrigation. You might get the crop now but, next year, the whole lot might get burnt up. So, really, we have no choice. The problem is, if you introduce any kind of farming where you need to plough the fields every year, then it becomes a nuisance because you've got all these buried pipelines of the dragline system.

Q: So what do you do when you replant?

A: We try to avoid ploughing up the pipes. Really, quite a lot of it does get damaged but we just have to live with that. The cane is in the ground for ten years. It is not a great problem. So, if it was a normal vegetable farm that would be growing two to three crops in the same land every year, it would be an awful nuisance.

Q: So it's not a system for that kind of intensive vegetable crop?

A: I wouldn't think it would be.

Q: And, on the cabbages, you've got something else?

A: We use a normal portable sprayline. The plastic pipes are buried there but we just use the sprayline.

Q: This is where you've got cabbages and cane on the same land?

A: No, we follow the eight to ten years of cane with the vegetables and then back to cane again. The vegetables are only in for about nine months or so. The cane would be ploughed out about this time of the year, towards the end of the year. Cabbages would go in late summer and go through to spring, and then we'd go back to cane again. So it's not a whole year. But, in a sense, it is a year: it's the whole season.

Q: And then that's cane for ten years, and this bridges to the next month when the cane needs to be replanted. And the whole farm allows that.

A: Yes.

Q: You are happy with your supplier?

A: Yes, I find him a very practical person and he has some very good ideas. I think some of his ideas might be a little bit strange but, you know, I think he's very practical and, as a supplier, he's been pretty good. I have no complaint there at all.

Q: Can you comment on the kind of outlay that all of this involves? What kind of position does it put you in? I mean, do you have to do it on loan, overdrafts, whatever? Or do you have to wait until you've got the cash?

A: I haven't actually raised loans for financing at all and neither have I negotiated overdrafts

specifically for that purpose. And I haven't always waited until I've been able to put the money aside. I've done it as and when I needed to do it, provided, of course, I had funds to do it. I've tried to keep it within my own financial limits.

Q: **You must have some sense of what the upgrade costs you per hectare roughly.**

A: Well, very vaguely, because the price has changed as we have gone along. The last that I did, just as a rough sort of a guess, was about R8 000 for 16 hectares — R500. Yes, it must have been in that region: about R500 a hectare. That's an upgrade to the laterals, not the main lines. It's the sprinklers and draglines, that type of thing. It's a long time ago that I put in a new scheme from scratch. A lot of these things have been going for many years.

Q: **That's what you talked about in the beginning, what you did in the late 50's and the early 60's.**

A: Yes. You see, the basics had to be put in a long time ago and, now, I think we've stretched to the limit. If we wanted to pump more water now, we'd have to go right back to source again and upgrade from there. That would be terribly expensive. One doubts whether it would be worth it. Certainly not for growing sugar cane.

Q: **What are the returns per hectare for the irrigated cane? About a thousand, twelve hundred, or something - roughly?**

A: You're asking me something I haven't thought about yet: gross returns per hectare. I can't put a figure on it.

Q: **I'd say... it is somewhere around about a thousand rand per hectare. It must be in that region. It is not a great return but it is a fairly stable one. It is very stable, you see, because there is a protected domestic price. That is all A-Pool cane, isn't it? Or is it?**

A: Well, I do have a little bit of B-Pool cane but, obviously, it is not in my interest to produce B-Pool cane. So the return of about a thousand rand a hectare is nothing to get excited about but, at least, it is pretty certain that you'll get it.

Q: **But some of these vegetables are very volatile.**

A: Yes.

Q: **So, in a sense, if you're looking at the whole enterprise, the cane is a kind of a stable thing against which you can try out all things. You know you've got that kind of a backdrop for security.**

A: The cane is there for me as the backbone of the operation and then, hopefully, we'll make some money out of the other things.

Q: **So the cabbages are a much higher return per hectare?**

A: Yes. The good was extremely good but the poor was really poor, this year. It was all to do with price. I would say that to put cabbages down at R3 000 a hectare on average is perhaps being a little bit optimistic. I mean, it can be easily obtained but I wouldn't like to suggest that that's characteristic. Because, if one did, I think one would be disappointed.

Q: **Where do you market the cabbages?**

A: Market is right on the farm, you know: to hawkers coming to buy directly from the field.

Q: When you say hawkers, who are these hawkers?

A: Everyone. Indian hawkers. Some of them are retail hawkers and some of them are wholesale hawkers. They come and collect.

Q: Have you got a network of people who know the farm, and who you supply to quite permanently?

A: It is not that form of basis at all. It is very much a casual thing: we've got cabbages for sale and they come and buy them. And, if they don't come, then we've got cabbages that we don't know what to do with. It is a little bit of a risky thing. But then, of course, we can market what we don't sell to them to municipal markets.

Q: And do you do that sometimes?

A: Yes. We always do market a certain percent. I'd say, on average, maybe about 40% on the municipal market and 60% on sale on the farm.

Q: When you extended the farm, did you use Land Bank finance or anything like it?

A: I've never used Land Bank finance because they wouldn't give me finance, and that is the crazy thing.

Q: Yes, I am very puzzled about this business about the Land Bank, because I have asked quite a few farmers, "have you ever used the Land Bank?". They all say "no" and one person said very caustically "I'm not even prepared to comment on how the Land Bank operates".

A: I think things may have changed in more recent times. There are a lot of people who are using the Land Bank to purchase property. But I've never done it through them. I've been financed through mortgage bonds. And my father was able to give me second bonds to help me to get going. But it was all paid.

Q: So you are not bonded now?

A: No. You can only be growing cane here if you don't have to pay off the farm at the same time.

Q: So, electricity is quite a critical factor?

A: I think, if you had to go for maximum production per hectare, then it would be a lot higher. Because we're so far from the mill, what we actually need to look at quite carefully is the percentage of sugar in the cane that we're sending, instead of sending tons of stuff that is worth nothing.

Q: So it is the sucrose that you really have to think about.

A: Because of the transport.

Q: You do your own transport?

A: Yes. If you hire someone else, he makes a living out of the transport. On the cane, the return per rand spent for 1990/91 was only R1,19. So it is about a 20% return on a rand spent. It is really not enough.

Q: Is this on the whole farm or on cane?

A: No, that is on the cane operation. And the vegetable operation would probably be in the region of R1,35, or something like that, per rand spent, which is a much better margin. On the one side, the cane is stable and prices don't fluctuate too much. It's just that our costs

are getting a little bit too close. And, you know, we've got to replace tractors and trucks, that type of thing.

Q: **It becomes a near thing.**

A: A bit worrying. I think our only real salvation would be if this sugar mill moved up from the coast. If that happens, it will straight away make the whole operation look very different. You could live off the money you would save on transport. So it would make a tremendous difference.

Q: **Otherwise you might increase on the vegetable side, possibly.**

A: I'm sure we can expand the vegetable side but I don't think we will be able to convert 240 hectares of cane land into vegetables. That is too much. It will cause over-production.

Q: **That comes back to the point we were making earlier, that the cane is not brilliant but it is stable.**

A: If the cane could just pay the expenses, we could live off the vegetables.

Q: **What is your experience as far as labour is concerned?**

A: The numbers remain fairly constant through the year. We do lose quite a number on the Christmas period; they like an extended holiday. They start filtering back towards the end of January; you know, when they have run out of money. We probably run around about 75 units most of the year round. It seldom goes beyond 85. That is all labour that resides on the farm. So it actually works fairly well, because the numbers we've got are able to handle the work we do. I don't know what would happen if we needed more labour, whether we would be able to encourage more people. I've found out, over the years, that it reaches a saturation point, where you don't seem to get any more. If you employ an extra person, somebody else will leave. It seems to stabilise, to reach its own saturation level, and I don't know why it is. It's a strange thing.

Q: **So it is not easy to increase your labour force just like that.**

A: Yes. It would probably be a little bit difficult to increase it. It's difficult to say. It seems to be a sort of a seasonal thing, you know. At times, you get a lot of people inquiring about work. If you don't employ them, then the message seems to get around that there is no work and then nobody comes. But, probably, if I started employing, this would generate more interest and I would have more people.

Q: **Do you have core people that have worked for you for a long time?**

A: Yes. A third of the men and probably a half more of the womenfolk are pretty constant. They just stay year after year.

Q: **What do you think about legislation regarding farm workers and possibly unionisation and so on?**

A: I think, as a farmer, I'm probably much the same as other farmers: we don't like change. I think it is scary because the working relationship that we've got with the workers on the farm is quite a lot different from businesses operating in town. At the moment, it works pretty well and, if you were able to change overnight and run this place as a factory, it would probably also work very well. But the transition from one to the other can only put us in trouble. I am apprehensive about worker's organisations, because I don't know quite what the implications are.

Q: Do you use a computer at all in doing your management? Apparently the Experiment Station has devised some sort of a cane programme.

A: I'm on one of the computerised systems. It is called Cane Farms, and your cheques are coded. It is all done on the computer. You get a monthly report and, at the end of the year, you get a final report, with all your orders listed. That I hand to my accountant, who then draws up the balance sheet and does the rest from there.

Q: What would be your comment on the Experiment Station or on the Sugar Industry, from the point of view of extension and assistance? What do you think of the extension system that is available?

A: I think it is pretty good and it works very well. It is probably better than most other services in agriculture, although I don't know what its like in the wine growing areas or fruit areas. Maybe they are equally well organised, maybe better.

Q: There isn't anything for vegetables, is there?

A: Not really, but one can get information from the University (Pietermaritzburg), although it is not a formal thing. I think it might develop in time and I think it would be great value to the vegetable growers because, a lot of the time, one is groping in the dark. Most of the time, one has to rely on the recommendations of reps.

Q: What sort of reps?

A: Fertilizer reps, and chemical. And these people have a vested interest somewhere down the line, so you don't quite know how reliable their advice is.

Q: It would be nice to have an independent back-up system of some kind.

A: I don't think enough work has been done in South Africa to really have a comprehensive system. You know, other areas have been attended to but I don't think there is enough in one place to be able to get all this information that is required. If you're talking about vegetables, you're looking at a number of different crops, and it is not like sugar cane.

Q: Could you talk a little about the Irrigation Board and how that works?

A: It started years ago. We were concerned about the state of water supply. The river was really battling to cope with irrigation. At peak flow periods, it wasn't a problem because that period also coincided with your high rainfall periods. So we were having problems during winter, late winter, early spring, running short of water. It was decided to form this irrigation district from right at the top down to the last farmer down here. It worked like that for a couple of years and we had people on the Irrigation Board, who were voted in by the farmers to have some sort of control. The Board was given the job of trying to divide up the water supplies so that everybody had a chance. That was based on one's requirements, and it was generally based on one's hectarage under irrigation. Each farmer had to register a certain hectarage of land under irrigation and the water supply was based on that. If restrictions had to be imposed, it was done proportionally to the hectarage and it worked out finally to a number of hours per week. It was up to the farmer concerned to adjust his area under crops to fit in with that pumping time. That helped but there were people who tried to pinch a bit more than their requirements. There were a few unpleasant incidents. Finally, the Board looked into having a dam built on the river.

It took a few years for that to get off the ground and the financing of it came through water levies paid by the farmers, based on their area under irrigation. With the aid of the

Department of Water Affairs, we were able to build the first dam. They subsidised it by 30%, their normal sort of subsidy and the loan is repayable over thirty years. That really has transformed the whole thing. A couple of years later, we built our second dam. The system has worked well. There is a water bailiff who controls what's going on.

Q: **You don't pay for water, do you?**

A: No, we just pay a levy per hectare, which hasn't changed since the first dam was built. It is still at R40 a hectare, which is really for nothing. There are many areas paying up to R150 a hectare so our area is actually quite cheap.

Q: **This covers the bailiff, and all the services that go with it?**

A: Yes. The bailiff, the servicing of the line, and repayment of the line: everything.

Q: **You know, we were talking about how things are getting pretty marginal and difficult, when you look at costs and returns and so on. Do you think that, in the valley generally, there are quite a few people who are going to go to the wall?**

A: It is difficult to pinpoint the reason why some farmers are not making it, but I would think one of the main factors is that they may have paid too much for the land. They had to borrow the money to finance it. I think that is really a root cause of the whole thing. Because the potential, you know, from the production point of view, is pretty good, generally speaking. There are some poorer areas but, on the whole, it is productive. The water is there. The markets are close by. Not that the markets are always that reliable but they are there. I think it has a lot to do with the interest rates, which have aggravated it, but that came about because these farmers have had to borrow probably 100% or maybe even 120% of the value of the farm to get going. And the farms are just not able to service that.

Q: **This suggests that people who are going under are perhaps the more recent entrants to the profession, rather than people who have a longer history, like yourself, where the farm is not bonded.**

A: I would say, if the farm is paid for, then you've really got to try to do a lot of things wrong. Whereas, if you owe money on the farm, you can do everything right and you still don't have a chance. If you take the older established farmers, their whole structure is based on what they paid fifteen, twenty, thirty years ago. So their capital input has remained at that kind of level. The whole thing is working on yesterday's capital input. So inflation hasn't inflated their capital input, whereas people, who have come in more recently, had to pay that inflated value for land.

Q: **And they have had all sorts of additional costs with capital inputs like tractors and so on. So they've been caught in two ways. First on the land, on the bond, and the interest and, secondly, on the inflation on capital inputs.**

A: Whereas inflation only caught us on replacements and on transport. So, theoretically speaking, we should be around when quite a few other people have gone under. This is not to say that we might not go under. There is no guarantee. Our return on capital investment is far greater than that of somebody who started a year ago. So maybe we are surviving on capital appreciation. At what stage that runs out I don't know.

Q: **Well, it must be a pretty stable basis.**

A: We've had our bad years. Those drought years nearly upset the boat and that was over a

period of three years. I think a fourth year might have been terminal. The sugar production dropped from about 16 000 tons per annum to about 5 000, in three years. That is a huge hole. And the vegetable production was probably doing in the region of 25 hectares before the drought. In the drought, we managed to do about 3 hectares at a time. The allocation of water was only such that we could perhaps look after about three hectares.

Q: **I suppose one should ask a little bit more about irrigation management, something about scheduling.**

A: On the sugar cane, I try to complete a cycle in about 14 days. It is a little bit different with the vegetables, because we don't irrigate through the night. On the cane, we irrigate day and night for six days of the week. For the vegetables, it is only practical to irrigate during the daylight hours. So the system is a bit different there. With the vegetables, I try to apply about 25 mm per week of irrigation. So we try and get around once a week. It doesn't always work like that but that is what we try to do. For cane, obviously we try and last for two weeks. But it is really more supplementary than total irrigation on the cane. You know, we can't apply sufficient water in really dry, hard periods; you are always behind. To be able to do a total irrigation, we would require probably at least 50% more equipment and the upgrading of pumps. I doubt if that would be economical, in terms of what return I get on it. So you have just got to take a little bit of a chance. So, maybe we lose a little bit of production because we can't irrigate at peak periods, fully, but, of course, we get rain as well, which helps. It's a calculated risk.

The irrigation's stand times are aimed at 12 hours per stand. That is because they are moved in the morning and then again in the evening but, in practical terms, it does not quite work like that. The days seem to be shorter than the nights, for some reason. It is difficult to get people to work very early in the morning and in the evening again; then your day seems shorter and the night gets longer. But it works ok.

Perhaps I just need to say that, on the cane, the amount of irrigation depends on the stage of growth of the cane and the time of the year but, as it gets bigger, it needs more. We try to (provide) its requirements.

Q: **Following the crop's requirements, do you have any sort of technical advice about what they should be like, how many millimetres it is or whatever?**

A: That sort of information is available, pretty good stuff but I don't follow it.

Q: **Do you just play by feel?**

A: Yes. Part of it is, if you look at the advice, there is a lot more than you can possibly manage. Yes, it is better to adjust it a bit. Well, I think, over the years, I've gained a feel for it, whether it has been a good one or not, I don't know. I think a lot of farming is really a feel and experience. You know, people sometimes ask why do you do a thing in a certain way, and you don't know why you do it any more. You've forgotten why you did it that way. But we'll see, in future, maybe we're going to have to try and become a bit more technical.

Q: **Clearly, you've got some sense in which you don't go for maximum production. What you go for is some kind of feasible level of production, which is going to give a certain kind of return in relation to costs and so on. So it is quite a calculated thing that you do. Is that what you are suggesting?**

A: It is a thing that I don't think you can actually calculate. Certain areas maybe one can calculate, the application of fertilizer being one of them. You can reach a point whereby any further fertilizer application is going to give you a negative return. That perhaps can be calculated.

Q: **But does a high transport cost relate to a slightly lower level of production? I mean, I heard what you said before about sucrose being a critical issue because of the transport.**

A: That is what you're paid for. So, if you could transport loads of pure white sugar in bags, your cost per ton of sugar would be lower than if you were hauling sugar cane, which only has 5% sucrose. The shorter the cycle, the higher the yield, but, if we cut once a year, we'd have to fertilize once a year, or do the whole spray programme once a year. It would double the sort of labour requirement.

Q: **How often do you cut?**

A: I'd say more like every sixteen months, on average, but some of the cane might only be cut after twelve months and some might be cut after twenty months. But, when you take into account the cost of irrigation, the cost of transport, and other things, it might pay to extend that cutting cycle to, say, eighteen months, which then may guarantee your high sucrose percentage. It helps on the transport side. Because we're kind of limited with A-Pool, we can produce 110% (this year, 140%) of our A-Pool in the form of B-Pool. But I do it because we are losing money on every ton we produce. So you want to produce your A-Pool and not a ton more. So it may be better to extend the cycle — but there is another way: you might be able to do it by using artificial ripeners to ripen the cane to give you that higher percent of sucrose, and then cut down on your area under cane to stay limited to your A-Pool tons.

Q: **I believe your son is joining you.**

A: So now we've got an extra family to look after. So maybe we've got to look at some higher level of production. We should be able to handle more management-intensive operations. Up until now, I've been doing what I have done for some time. To me, there didn't seem to be much point in overloading myself any more to try and go for maximum production. It might sound like a lazy way of doing things but one has one's limits. Farming is not just a straightforward operation. There is financial planning. There is planning of crops. There is maintenance of equipment. There is labour relations, whereas, in industry, you have one manager for each department. So one farmer can become a little bit overloaded. And then you get involved in committees and things like that. It takes time. And then you have additional things, like the JSB's, the VAT's, and so on.