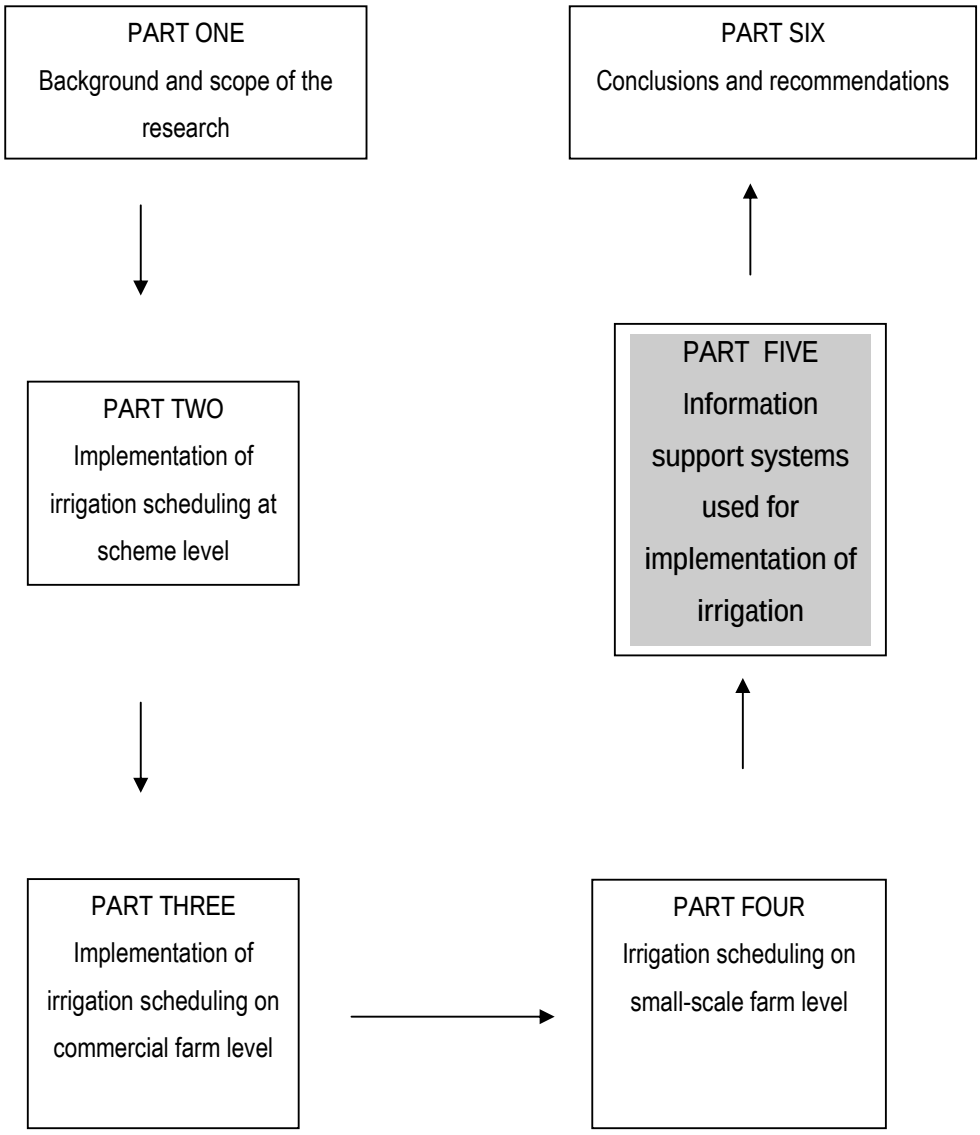
PART FIVE
INFORMATION SUPPORT SYSTEMS USED FOR IMPLEMENTATION OF IRRIGATION SCHEDULING



CHAPTER 18

AGRICULTURAL KNOWLEDGE SUPPORT SYSTEMS USED FOR IRRIGATION SCHEDULING

18.1 INTRODUCTION

In Chapter 9 (section 9.2) the role of various actors was identified in creating awareness with regard to the potential role that irrigation scheduling can play on the farm. This intervention helps to create the conditions for learning about irrigation scheduling. This chapter identifies the role of "outsiders" (e.g. scientists, experts from industries and irrigation consultants) and "insiders" (e.g. family members, fellow farmers, opinion leaders) to inform and help farmers with the implementation of on-farm irrigation scheduling.

18.2 AGRICULTURAL KNOWLEDGE INFORMATION SYSTEMS USED BY IRRIGATION FARMERS

Farmers make use of a variety of information sources that forms part of the Agricultural Knowledge and Information System (AKIS), which links irrigation farmers and institutions to promote mutual learning and generate, share and utilize irrigation management technology, knowledge and information. The AKIS system integrates farmers, educators, extensionists and researchers as part of the agricultural knowledge triangle to harness knowledge and information from various sources for better farming (Röling, 1989; Engel & Solomon, 1997; FAO & World Bank, 2000).

Knowledge can be seen as the basic means through which farmers understand and give meaning to the world around. Knowledge and perceptions are closely intertwined with the concept information. According to Leeuwis (2004), perceptions or meanings inform us about a particular state of affairs, and this constitutes information. With the help of information, farmers reduce uncertainty and bring order to the world around them.

The process of introducing information on a new irrigation scheduling method into the farmers' psychological field or life space requires appropriate support and communication network structures between researchers, irrigation system managers, extensionists, consultants, advisors and farmers. There is an increasing recognition that in order to understand information seeking, we need to understand the social context in which it takes place and the factors that influence it (Chang & Lee, 2000; Cool, 2001; Solomon, 2002). Information seeking in its broader context is often termed "information behaviour", which is defined by Wilson (1999) as the activities a person engages in when identifying his or her own needs for information, searching for such information and using that information for decision-making. As Webster (1995) points out, the semantic definition of information implies that "information is meaningful, it has a subject, and it is intelligence or instruction about something or someone".

The opinions of family members are often incorporated into the process of decisions making in farm management and the selection of irrigation technologies (Ellis, 1993; Jackson, 1995). Beyond the household members, irrigation farmers access multiple sources of information and belong to a diversity of "learning systems" (Schön, 1983, Lundvall, 1992; Kilpatrick, 1997), which include both formal and informal information networks. Expert advisors, farmer groups and training events form part of this network and play a crucial role in adoption decisions (Chamala & Mortiss, 1990; Frank & Chamala, 1992; Pretty & Shah, 1994; Chamala & Keith, 1995).

Farmers draw from a range of sources and types of information in their interactive learning about irrigation management (Figure 18.1), which also serve as learning organizations (Senge, 1993):

- *Private irrigation consultants*, which provides consultation services, based on a user-pay system. A more detail discussion of the profile of private consultants involved in irrigation management will follow in Chapter 19.

- *Cooperative extension officials:* some of the bigger agricultural cooperatives are rendering an irrigation scheduling service that is also based on a user-pay system, where farmers are responsible for the direct cost involved with such a service (e.g. transport and basic fee per visit).

- *Representatives* of seed, fertilizer and pharmaceutical companies.

- *Fellow farmers or the farmer himself*.

- *Extension officers from the Department of Agriculture and officials from Department of Water Affairs.*

- *Farmer study groups and growers' societies* like the avocado, banana, and table grape grower's societies.

- *Representatives and advisors* from irrigation companies mainly responsible for the designing of irrigation systems and selling of irrigation technology.

- *Commodity institutions or industry specialists* like for instance Vinpro (KWV), Cape span (citrus and deciduous fruit), SASRI (South African Sugar Research Institute), etc.

- *Irrigation Board Scheme or Water Users Association officials*.

Figure 18.1 shows significant differences with regard to the information sources that irrigation farmers use to help them with irrigation management decisions ($F=5.0$, $p=0.038$). The respective role of each of these information sources as revealed in Figure 18.1 will be discussed.

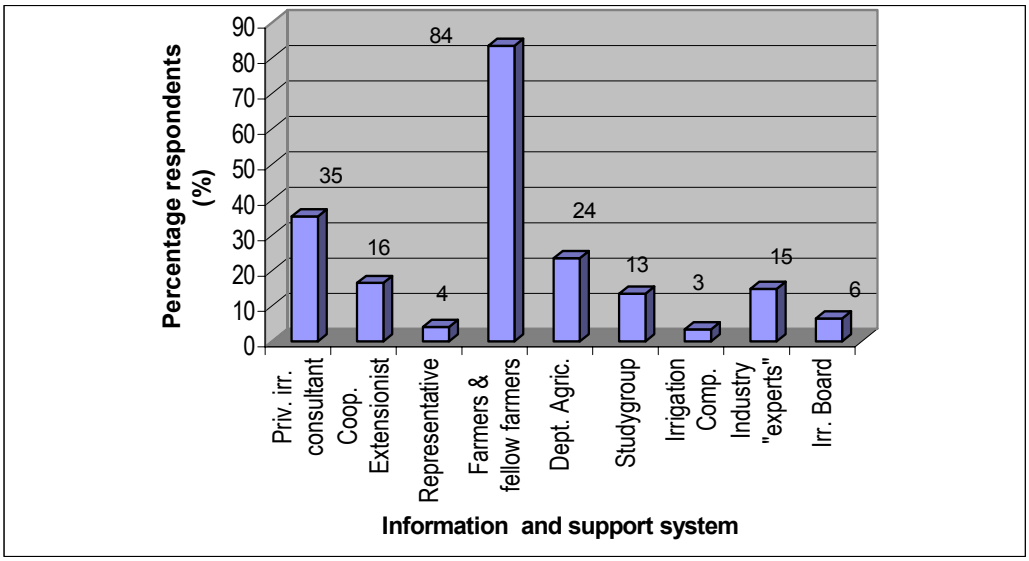


Figure 18. 1: Percentage distribution of respondents according to their use of various information and support system regarding irrigation scheduling (N=297)

o ***Role of "insiders" as agricultural information source***

The majority of farmers (84%) depend on their fellow farmers and themselves as their primary source for information and support regarding irrigation management and scheduling. Many farmers indicated that they regard their own farming experience and knowledge ("hands on experience") as more significant than the knowledge and information of industry "experts" and irrigation consultants. They often have extensive indigenous knowledge (local knowledge) of their own farming situations through close observations and experiential learning of the changes on the farm. This local farm knowledge was regarded as an imperative addition to scientific "facts" presented by the "experts" before the farmer can use advice for decision-making.

Apart from the use of the farm business as the internal learning system, farmers also seek advice from fellow farmers, perceived as "opinion leaders" or "gatekeepers" by their fellow farmers. The respondents perceive these "opinion leaders", usually experienced and relatively progressive and

influential irrigation farmers, as important sources of information and learning. The role of study groups (13%) was also highlighted as an important opportunity for informal interaction and social networking but also with regard to farmer learning. Such farmer-to-farmer interactions provide opportunities for farmers to compare views on how the "new" information could be contextualized within their own situation and to test each other's values, perceptions and attitudes towards making changes based on this information.

Respondents were asked to rate the importance of fellow farmers' knowledge and opinions for decision-making in irrigation scheduling on a ten-point semantic scale (Figure 18.2). Ninety percent of the respondents regarded information shared and collected from fellow farmers to be very important.

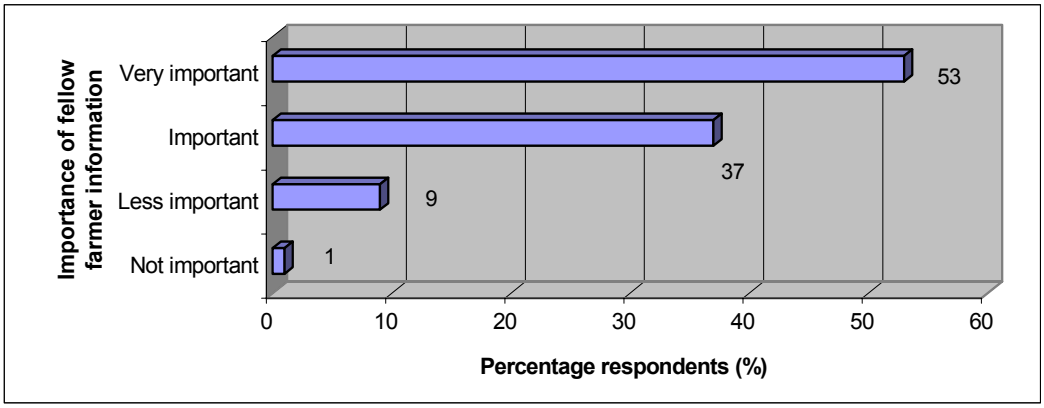


Figure 18. 2: Percentage distribution of respondents according to their perception of fellow farmers as an important information source for irrigation scheduling (N=134)

Knowledge and opinions gained from fellow farmers are perceived to be very valuable to irrigation farmers since it is local and comes from direct experience and observation over time. Many young farmers (23%) also referred to the potential "mentor role" that some of the experienced fellow farmers or "intimates" play regarding irrigation management decisions and farm management. The information and opinions of fellow farmers are perceived as an important source for both learning for change and continuous

learning. This association between the support offered by fellow farmers with regard to irrigation management and the implementation of on-farm irrigation scheduling is supported by a significant correlation (r=0.866, p=0.014).

Evidence from discussions with respondents suggested that family members (especially the father of the family) often play an important role in decisions to be taken on the farm, which also includes decisions regarding irrigation scheduling. The role of "intimates" often serves as a checkpoint for information and decision-making of irrigation farmers.

- ***Role of "outsiders" as agricultural information source***

Commercial irrigation farmers in the implementation of objective scheduling practices (Figure 18.1), often use services of private irrigation consultants (35%) and other professionals from the cooperatives (16%) and industry (15%). These professionals are usually used in cases where farmers apply computer models or programs and/or highly sophisticated scheduling devices like the neutron probe, capacitance sensor, etc. The respondents specifically refer to the important role that commodity institutions like Cape span, Vinpro, and SASRI play in the learning and support rendered to farmers with irrigation scheduling.

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These experts or specialists are perceived to play an important role in closing the gap between the providers of research information and the users of it. Hargadon (1998) referred to them as "knowledge brokers". A general tendency that occurs is that "new farmers" to irrigation, especially those that do not have previous farming experience, are more prepared to rely on the support and advice of industrial experts and/or consultants than on opinions shared by fellow farmers. A significant relationship (r=0.248, p=0.049) exists between the use of irrigation consultants and the implementation of on-farm irrigation scheduling by farmers without previous farming experience. These farmers acknowledged the valuable input received from irrigation consultants and industrial experts especially during the initial phases of irrigation farming.

"Industrial experts" are taken here to include professionals that belong to a specific commodity or industry i.e. deciduous fruit, sugar, wine cellars or citrus.

The role and importance of irrigation consultants for decision-making were tested in the survey, and Figure 18.3 summarizes these findings. Sixty two percent of the respondents assessed the role of consultants to be very important for the implementation of objective irrigation scheduling. This relationship between the implementation of on-farm objective scheduling by commercial farmers and the use of private consultants as an important information support system is significant (r=0.282, p=0.040). This implies that commercial farmers perceive the service and support of irrigation consultants as important for the implementation of objective irrigation scheduling, often as complimentary or additional to the farmers' viewpoint in decision-making regarding irrigation scheduling.

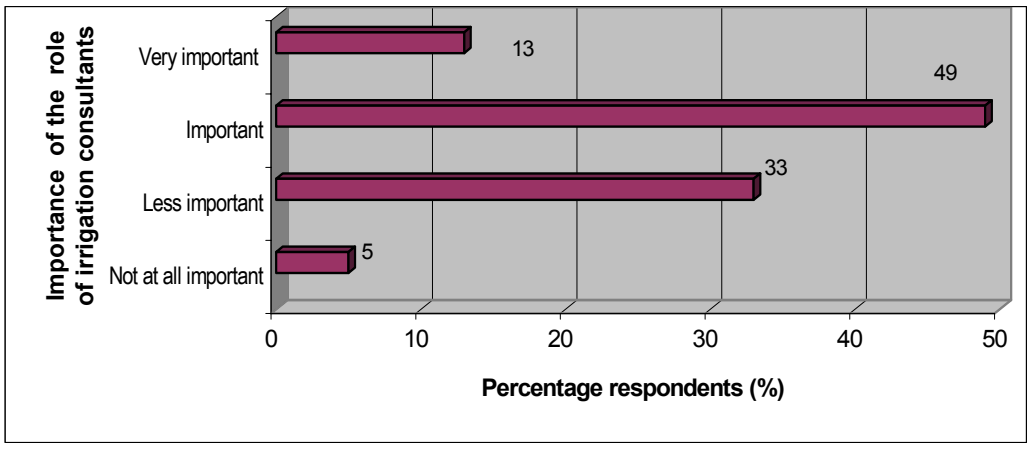


Figure 18. 3: Percentage distributions of respondents according to their assessment of the importance of irrigation consultants as information source for irrigation scheduling (N=134)

The contribution of the Department of Agriculture and Department of Water Affairs as agricultural information sources is perceived to be important for irrigation farmers. Twenty four percent of the respondents, of which 86

percent are small-scale farmers, make use of departmental information with regard to the implementation of irrigation scheduling. With the exception of irrigation schemes like the Rietrivier Irrigation Scheme and a few others, where commercial irrigation farmers are regularly meeting with both the Departments of Agriculture and Water Affairs, commercial farmers perceive little support from the Department of Agriculture with regard to the implementation of irrigation scheduling.

Amongst the small-scale farmers, government or departmental extension officers are the most frequently used learning sources for irrigation management decisions. A significantly positive relationship ($r=0.254$; $p=0.002$) exists between the use of departmental officers as information sources and the implementation of on-farm irrigation scheduling by small-scale irrigation farmers. This implies that the majority of the small-scale irrigation schemes depended upon support rendered by governmental extension officers with regard to the implementation of irrigation scheduling. This finding support the assumption that competent ground level support is necessary before farmers will implement on-farm irrigation scheduling (Hypothesis 4).

Commercial irrigation farmers also identified the relative unavailability of appropriate technical support from some research institutions in certain commodities like subtropical fruit and citrus. In these industries, farmers overcame the constraints through the establishment of respective growers' societies and study groups in the field of avocado, banana, mango and citrus. Some of these "interest specific groups" also appointed their own advisors to support farmers with different production aspects, including irrigation management and scheduling.

In some irrigation areas where local cooperative extensionists and private consultants are not rendering irrigation scheduling services and support, irrigation farmers (4%) rely on the support and consultation from representatives of fertilizer, agrochemical and seed companies (Figure 18.1). Farmers acknowledged the fact that these representatives are not irrigation "experts", but they identified them as important supportive role-players in

irrigation management and excellent “information brokers” with the outside world. For many farmers this is their only link with what is happening on neighbouring farms. The relationship between the use of representatives and the implementation of objective irrigation scheduling is not significant (r=0.211, p=0.558). This implies that these information sources are usually offer farmers a “recipe” or fixed irrigation calendar based on crop growth stage and the number of days after sowing or planting, rather than an irrigation calendar that takes the phenological stage of the crop into consideration.

18.3 CATEGORIZING THE LEARNING FOCUS

Farmers generally use three categories of information sources namely: interpersonal sources, mass media and interactive electronic information systems like computers, videos, etc. Rogers (1995) defined interpersonal communication as those involving face-to-face exchange between individuals and mass media sources as those enabling one or a few individuals to reach an audience of many. The third category of communication system, namely interactive electronic information systems also categorized as “machine assisted interpersonal communication”, came into use in the early 1980 (Rogers, 1983).

Learning implies cognitive change as we act and receive feedback from our environment. It is this kind of learning, as distinct from separate educational activities and teaching, that is crucial in adult education. Learning therefore occurs and is required at various fronts in the changing of behaviour (Leeuwis, 2004). The findings in Figure 18.1 illustrate that commercial as well as small-scale irrigation farmers approach problem solving and learning in different ways (F=5.819, p=0.017). Farmers usually approach problem solving according to the different styles of farming, the farmers’ personal business and industry characteristics (Vanclay & Lawrence, 2001). Some farmers prefer listening, others reading, others observing while others learn-by-doing *(experiential learning)* (Dunn & Dunn, 1978).

Based on the different information sources that irrigation farmers have at their disposal (Figure 18.1), farmers associate with mainly four different learning groups regarding the use of irrigation information:

- *Localized information source:* The local focused group of farmers makes use of information and advice/opinions mainly from fellow farmers, study groups, local experts like departmental extension officers, irrigation board scheme officials, water user association officials, local cooperative extensionists. This group also perceived local field days and representatives of seed, representatives from agrochemical and fertilizer companies as important information sources for decision-making.

- *Specialist or expert information source:* This group of farmers' uses private irrigation consultants, specialists from the Agricultural Research Council (ARC), industry related expertise like SASRI, Cape span, Vinpro, professionals from universities or tertiary institutions, and designers and planners from irrigation companies in their learning process.

- *Formal and informal training in irrigation scheduling*: Fifty eight percent of the irrigation farmers interviewed indicated that they have attended formal or informal training in irrigation scheduling. Farmers however differ in their preference for using formal or informal training opportunities. The majority of irrigation farmers (62%) interviewed prefers informal sources of learning mainly because they are familiar with them, and they can choose learning sources, which fit their specific needs and situation (preference for independence). For example, fellow farmers and neighbours are often approached for background information and for information on practical implementation of irrigation scheduling. This group of farmers usually contacts consultants and advisors from commodity institutions for detailed technical advice needed for decision-making.

- *The use of the printed media and information technology (IT) as sources of informal learning:* The most important printed media source used by the majority of commercial farmers (72%) is either the newsletter or information leaflet from the local cooperative or relevant commodity institution like sugar, barley, or popular articles that occurs in the Farmers Weekly, Landbouweekblad or Nufarmer for the small-scale farmers. The printed media is often used to increase awareness relating to a practice like irrigation scheduling and often acts as a stimulus for further discussion and debate between farmers.

  Although computer usage by commercial farmers was found to be common, it is often not used for "learning" about irrigation management, but rather for record keeping, financial management and for obtaining quick and up to date information on marketing, weather patterns and research. The use of existing computer scheduling models and programs, often built with rigid mathematical methodology, is still limited (16%) as indicated in Part Three, and the majority of irrigation farmers found the use of computer models and programs relatively difficult to interpret and complex without the necessary ground level support.

It is of the utmost importance that clear and concise information on the costs and benefits of alternative irrigation scheduling methods are available. "Effective information" is usually generated much slower than generally assumed, and simply the "dumping" or provision of technical information about irrigation scheduling to a farmer, might not be appropriate. However not all farmers learn in the same manner as illustrated in Figure 18.1, and therefore differ in the learning sources they access for learning.

Understanding the cognitive styles of individual irrigation farmers or the individual groups of irrigation farmers can assist the extensionist or advisor to focus on the most appropriate means of offering the irrigation scheduling innovation package to farmers as part of a holistic management plan for the farm. Based on the response of respondents about the information or learning

sources they accessed regarding irrigation scheduling, four distinct learning pattern groups of farmers could be identified:

- Farmers who do not consult additional information source regarding irrigation scheduling on the farm, but mainly rely on their local experience and knowledge in irrigation decisions.

- Farmers that regularly consult at least another learning source before decisions are taken on irrigation scheduling, usually within the boundaries of a specific farming area (localized knowledge).

- Farmers that consult at least two additional information sources regarding irrigation scheduling, before changing or making decisions regarding irrigation scheduling.

- Farm businesses that use a wide range of information sources (three or more additional learning sources) before decisions are taken regarding irrigation scheduling. These sources may include experts, training, fellow farmers, media and general observations.

a) Relationship between learning sources used and implementation of irrigation scheduling

Figure 18.4 reflects the degree to which farmers use a multitude of sources in the implementation of irrigation scheduling. It is clear from Figure 18.4 that 90 percent of farmers are making use of one or more additional learning sources, while 10 percent indicated that they rely only upon themselves for decision-making regarding the application of on-farm irrigation scheduling practices.

A tendency was found that younger farmers are in general more willing to make use of additional learning sources, especially computer-assisted support and publications than farmers aged 66 years and older ($r=-0.394$; $p=0.015$). This finding provides evidence in support of Hypothesis 1.2, namely that the age of farmers as an independent variable determines the perception

of learning sources needed, before an innovation like irrigation scheduling will be implemented.

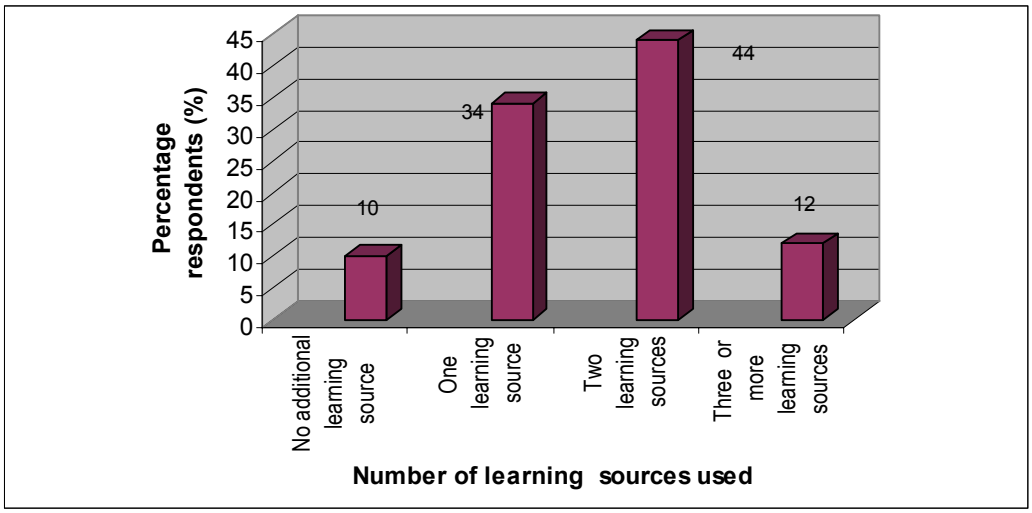


Figure 18. 4: Percentage distribution of farmers according to their use of multitudes of learning sources (N=134)

It was also found that as the size of irrigation area increase farmers are generally more prepared to use additional learning sources (r=0.230; p=0.038). This significant relationship provides evidence in support of Hypothesis 3, namely that objective irrigation scheduling is too complex, expensive and time consuming for many farmers but more appropriate for the large growers who often have higher incomes and flexibility with labour.

Figure 18.5 highlights the relationship between the number of learning sources used by farmers and the implementation of objective and subjective irrigation scheduling methods. This shows that irrigation farmers differ with regard to the number of learning sources they consult before they implement irrigation scheduling (X^2=8.90, df=2, p=0.022). Sixty six percent of the farmers that make use of objective scheduling methods consult two or more learning sources, while 58 percent irrigation farmers involved with subjective scheduling methods consult less than two learning sources.

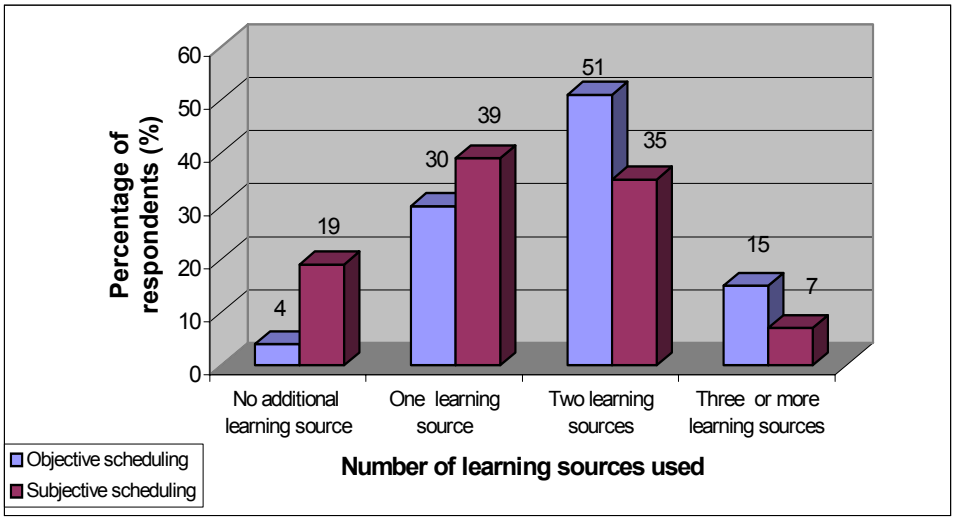


Figure 18. 5: The percentage distribution of respondents according to type of irrigation scheduling used and the number of learning sources consulted (N=134)

A significant relationship exists between the number of learning sources used and the implementation of on-farm irrigation scheduling (r=0.244, p=0.007). This implies that farmers, who apply objective scheduling methods, are more inclined to use more than one information or learning source. Irrigation farmers involved in the application of subjective scheduling methods on the other hand are more willing to rely on personal experience and perhaps the use of one additional source of information, usually within the boundaries of a specific irrigation area ("localized knowledge").

18.4 PERCEIVED ATTRIBUTES FOR EFFECTIVE KNOWLEDGE SUPPORT

The following attributes of an irrigation consultant and extensionist are, according to respondents, very important in the building of trust, credibility, delivering of an effective irrigation scheduling service (Table 18.1).

Table 18. 1: Percentage distribution of respondents according to the perceived attributes of irrigation extensionists/advisors to be critical (N=134)

Attributes of irrigation consultants	Number of respondents (n)	% Respondents
1. Technical competence	56	42
2. Affordable support service	54	40
3. Timely, focused and accurate information	47	35
4. Integrity, credibility, trustworthiness and commitment	38	28
5. Preparedness to learn from each other	26	19
6. Practical recommendations and insight into the context of application	24	18
7. Ability to interpret data as measured, and not only acts as a "dip stick" offering data	18	13
8. Availability, empathy and interpersonal sensitivity of consultant	15	11

Table 18.1 reveals that the following attributes of advisors and extensionists as identified are critical for the building of trust and credibility:

- The first qualification farmers expect of irrigation consultants/extensionists is *experience and competency in the irrigation area (42%).* The consultant must have both educational and practical knowledge of the irrigation system's operation and management, which includes irrigation scheduling. Farmers perceive this attribute in general as an important basis for the building of long-term extension relationships.

  The advent of computer irrigation scheduling and the use of sophisticated scheduling devices like neutron probes, etc. that necessitates the use of appropriate computer software, has resulted in some activity by irrigation consultants. Computer experts without proper experience and training in irrigation management and general agricultural production are not in a position to help farmers with the interpretation of data measured in the field.

- *Timely, focused information (35%):* In general, there is an expectation that the irrigation extensionists/advisor should be able to understand the bigger picture. An advisor /extensionists should be aware of what new irrigation technology or practices have or are being developed. They must keep the farmer informed about the appropriateness of this innovation to the specific farming system. Many farmers acknowledged this attribute as the biggest advantage of an irrigation consultant or extension services.

- *Integrity and credibility (28%):* Advisors/extensionists are expected to be unbiased, trustworthy, maintain confidentiality, and be reliable.

- *Understanding the context (18%):* It is important that the irrigation extensionist /advisor must be well informed about tendencies and the latest developments of the specific industry with which the farmer is involved. They have to make recommendations that are adapted to the farming system and management style of a specific farmer, but also reconcilable with the social norms and values as applicable for the specific farmer.

- *Ability to interpret measured data and communicate effectively (13%):* One of the constraints of many of the irrigation consultancy services rendered to farmers is the fact that many of the consultants are not in a position to correctly interpret the data they have measured because of their insufficient or inappropriate formal training. Providing information alone without contextualizing it has not been perceived to be very effective to farmers. Since irrigation scheduling is about providing information concerning a living, dynamic plant-soil-atmosphere ecosystem - basic knowledge and experience in agronomy, soil physics, climate, irrigation engineering, irrigation economics and the interaction of these elements are required.

  Furthermore, it is of utmost importance that advisors and consultants understand and act on the knowledge they have gained regarding the learning preferences of the farmer. It was indicated that the manner in

which the measured data and information needed for irrigation management is presented and packaged for a specific farmer will only be effective if the specific business context and the desired outcomes of the farmer is taken into account.

- *Availability, empathy and interpersonal sensitivity (11%)*: The ability and availability of advisors/extensionists to identify needs and problems of clients as well as to offer support to farmers with appropriate information for decision-making are important characteristics of an efficient extensionist or advisor. The development of trust between the relevant parties through showing empathy with the needs of the farmer is an essential element for adoption of new practices.

- *Preparedness to learn from each other (19%):* Advisors and extensionists should be able and prepared to learn from each other and from the farmer as well. They should be prepared to take the responsibility for their recommendations, but also be prepared to listen, observe and interpret what farmers are saying. Many farmers indicated that they perceived the role of advisors, extensionists and consultants as being very negative. This is largely because they are inclined to impose the technology upon farmers, without adopting a participatory approach in this regard.

18.5 SUMMARY

The findings reported on this chapter revealed that farmers use different learning sources and systems in their integration of knowledge that fit the different farming styles as well as the specific stage of the lifecycle of irrigation farmers: The stage of the lifecycle of a farmer will influence his/her attitudes, perceptions and willingness to trial with new innovations.

- Some farmers indicated that they seek information and advice mainly from local experts like the local cooperative extensionists, fellow farmers, and water institutions like the irrigation board and do not regularly make use of “outside” information. Many farmers indicated that they have learned about

irrigation scheduling from experience gained over time. The local knowledge of farmers, which has been gained through experience, is an important source of learning. In addition to farmers learning from their own experience, they also learn from the experience of other farmers. The majority of respondents (84%) rely on the use of fellow farmers or their own experience and knowledge in the application of irrigation scheduling. As Scarborough *et al.* (1997) point out, farmers that act, as opinion leaders tend to speak the same language, literally and culturally, as their colleagues, and are faced with similar constraints and problems as fellow farmers, which enhance the relevance and credibility of their advice and views.

- The more progressive farmers and bigger farm businesses are more likely to use the irrigation consultants and experts of industries for advice. 35% of the respondents indicated the use of consultants as their major source of information regarding irrigation scheduling. Members of this group base their information on “opinion leaders” in the farming community.

- The third group is more of an outward focused group and consults widely whenever information is needed. Furthermore, this group is likely to be already participating in other learning activities like training, study groups, and external networking.

A significant relationship exists between the attitude of a farmer to use multiple information sources and the business context and size of irrigation of a farmer. Farmers involved in the use of objective scheduling methods are more willing and prepared to seek for additional information sources outside the irrigation area than the farmers involved in subjective scheduling methods. The farmers of the latter group are more prepared to seek information from fellow farmers and local information sources. These findings also support the general expectation that the differences in farmers’ goals and circumstances, the technology level and complexity of interactions and decision making by the farmer determines the choice of irrigation scheduling method selected and eventually the adoption behaviour. (Hypothesis 3)

Irrigation farmers identified several important attributes of an ideal extensionists/consultant like truthfulness; credibility as an extensionist or consultant is earned by being honest and treating people with the necessary respect. Being respectful when dealing with people involved in a change process include aspects like openness, honesty about one's intentions, making a real effort to help farmers to learn from the innovation and to respect people's decision even when they say "no".

CHAPTER 19
THE ROLE OF PRIVATE IRRIGATION CONSULTANTS AS A SOURCE OF LEARNING

19.1 INTRODUCTION

The complexity of irrigation technology, especially the use of real time irrigation scheduling methods, makes it difficult for many farmers to apply this technology on a day-by-day basis. It often necessitates refinement and the implementation of relatively sophisticated irrigation technology has generally been through support by industrial representatives, private irrigation consultants and extensionists from agricultural cooperatives. These service providers who are in regular contact with the irrigation farmers' often have considerable influence on farmers' decision making (Daniels & Chamala, 1989). The selection and evaluation of an irrigation consultant often poses a challenge for many farmers.

Presented in this chapter are some of the general perceptions and attitudes of irrigation consultants and important information concerning their training, competencies and experience that deserve consideration.

19.2 RESEARCH METHODOLOGY

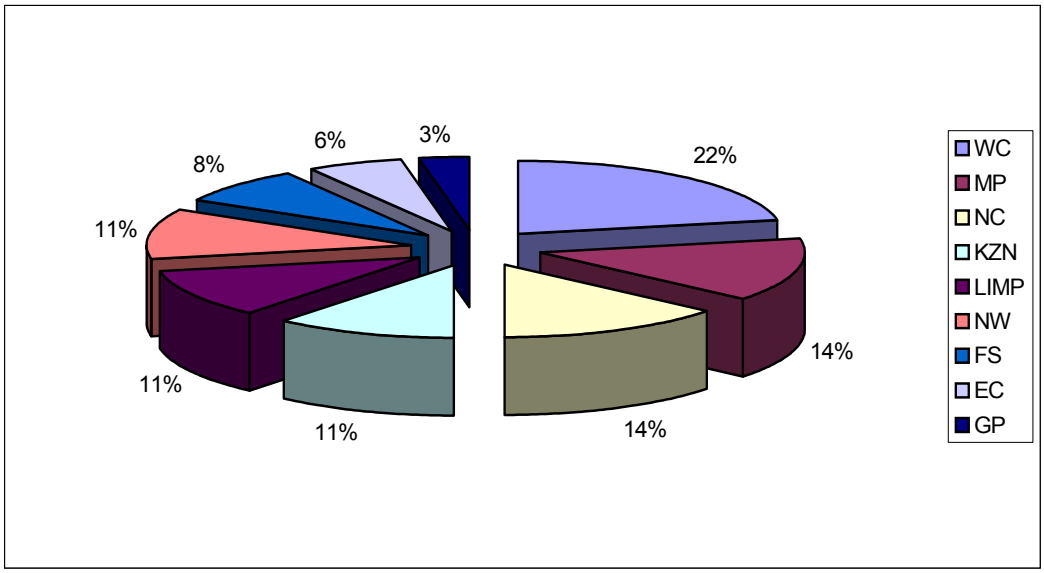
A qualitative study was conducted to identify the irrigation consultants and extensionists that are supporting irrigation farmers with the implementation of objective irrigation scheduling. The qualitative interview method was designed around the semi-structured interview guide approach (Patton, 1990), which involved developing specific subject areas for the interview. This qualitative format of in-depth interview was chosen, as respondents are more willing to respond to an open-ended semi-structured dialogue in a relaxed way rather than to a formal structured questionnaire, enabling a better understanding of the factors contributing to adoption (Bickman & Rog, 1998). Raising specific questions as an entry point for discussion started the interview, but adequate

space and time was left for interviewees to elaborate their views and raise new issues. This permitted questions to be customized to suit the different respondents and enabled the perspectives of the individuals to emerge. Approximately 70 semi-structured interviews were conducted with key individuals and opinion leaders within the irrigation-farming sector and included irrigation consultants and extensionists, irrigation designers, representatives of irrigation infrastructure companies and educational institutions that are regularly supporting irrigation farmers with decisions on irrigation management. The interviews with key people and opinion leaders in the irrigation industry served to identify consultants and extensionists responsible for irrigation scheduling services in the country and also helped to ensure that the desired data was being collected.

The focus of this qualitative study was confined to the thirty-seven irrigation consultants and extensionists identified and interviewed with specific reference to the use of the irrigation scheduling methods or techniques as part of their consultancy service offered to irrigation farmers and on their availability to be interviewed. The main areas covered during the semi-structured interviews were: identifying of the irrigation consultants/extensionists responsible for supporting farmers as well as the irrigation scheduling methods and techniques used; identifying of the clientele that use these services; identifying the perceptions of the necessary requirements to ensure efficient service delivery; identifying possible reasons why irrigation farmers often lack the necessary aspirations to use objective irrigation scheduling methods as well as some recommendations from the viewpoint of the consultant to keep in mind with the promotion of the practicing of objective irrigation scheduling. A single interviewer was used and each of these interviews was recorded on tape and later transcribed for analysis purposes. The approach used to analyse interview data involved observing primary patterns to sort the data into useful themes (Patton, 1990). In reviewing interview data it became clear that the utility of certain irrigation methods and techniques varied between the various respondents, but that certain common principles prevail in the effort to help farmers with irrigation managerial decision making.

19.3 GEOGRAPHICAL DISTRIBUTION

The geographical distribution of respondents in this survey (Figure 19.1) had a higher concentration of consultants operating in the relatively more intensive, high value cropping areas of the Western Cape (22%), Northern Cape (14%) and Mpumalanga (14%).



WC=Western Cape, MP=Mpumalanga, NC=Northern Cape, KZN=KwaZulu Natal, LIMP=Limpopo, NW=Northwest, FS=Free State, EC=Eastern Cape, GP=Gauteng

Figure 19. 1: Percentage distribution of irrigation consultants as per province (N=37)

19.4 TECHNICAL QUALIFICATIONS

The key factors contributing most significantly to the competence of consultants are their knowledge and level of training, whether formal or non-formal (vd Westhuizen, 2003; Childs, 2003). The formal qualifications of the consultants ranged considerably as indicated in Table 19.1, and all but one respondent have received tertiary qualifications.

Table 19. 1: Percentage distribution of the technical qualification of irrigation consultants and extensionists (N=37)

Education level	Number of respondents (n)	% Respondents
Technical diploma (Non-agriculture)	16	43
Agric. Degree	14	38
Agric. Diploma	3	8
Post matric qualification (Non-agriculture)	3	8
Grade 12	1	3
Total	**37**	**100**

The majority of irrigation consultants (51%) have a non-agricultural post-matric qualification (technical or engineering). This means the majority of consultants are technically qualified; it does not necessarily place them in a professional agricultural category. Irrigation farmers often perceive appropriate agricultural knowledge as a precondition for effective irrigation scheduling support.

19.5 EXPERIENCE

According to Table 19.2 the experience of the irrigation consultants varies considerably, with 19% of the consultants having been involved in irrigation management for more than sixteen years. Sixty percent of the consultants indicated that they have less than ten years experience in irrigation management. Since the mid 90's, many new irrigation consultancies were initiated.

Experience in irrigation management is usually associated with the acquisition of confidence and skills in observing, listening and analysing a specific situation and which is a prerequisite for providing help and support to farmers with irrigation scheduling. One of the more experienced respondents noted the following in this regard: *"It took me nearly ten years to understand what irrigation farmers really need and expect to enable them to make sound water*

Table 19. 2: Percentage distribution of the experience level of respondents in irrigation management (N=37)

Experience in irrigation management (years)	Number of respondents (n)	% Respondents
0-5	10	27
6-10	12	32
11-15	8	22
16+	7	19
Total	**37**	**100**

management decisions. This was due to the fact that in the past I always wanted to prescribe to farmers what to do and/or even tried to withhold certain management information from them to ensure them depending on my consultancy service. Subsequently I have realised that the more one can stimulate farmers to think, understand and act on the irrigation information provided, the bigger the demand for the specialised services from irrigation consultants become" (van der Westhuizen, 2003).

All of the irrigation consultants reported adequate competency in the use of computers and their ability to use appropriate software.

19.6 IRRIGATION CONSULTATION SERVICE FEE

The fee of any consulting service is highly dependent on the level and types of services available. Many consulting services (32%) not only provide irrigation scheduling services to farmers, but are also responsible for recommendations regarding fertiliser, insect control, financial management and general irrigation management (operating pressure, uniformity of deliverance, etc). 48 percent of the respondents indicated a consulting tariff charged per point of measurement, payable at the end of the production season.

According to irrigation consultants, the demand or need for irrigation scheduling services follows a seasonal pattern and is definitely more intensive

when farmers experience relative low rainfall years (drought). Farmers, who in the past have discontinued the services of professional irrigation consultants, are more prepared to employ them and spend additional resources for more clarity on the exact status of the soil water content level during periods of relative low rainfall.

19.7 PROFILE OF POTENTIAL CLIENTELE

Consultants and extensionists seldom have contact with all potential clients, but usually reach out to or are approached by specific user groups depending on their perceived credibility and acceptability. The attributes and characteristics of the clientele that usually engage in irrigation scheduling consultancy are summarised (Table 19.3).

Table 19. 3: Characteristics and attributes of clientele served by irrigation consultants and extensionists (N=37)

Attributes and characteristics of farmers	Number of respondents (n)	Percentage of respondents (%)
1. Business oriented people	12	33
2. Professional people that started farming	11	31
3. Farmers involved with intensive, high valued crops	10	28
4. Farmers from all categories viz. age, education, experience, size of farming operation, etc	8	22
5. Younger farmers	4	11
6. Corporative or estate faming concerns	3	8

Thirty three percent respondents indicated in Table 19.3 that their clientele usually consist of the relative more business-oriented farmers, while 22 percent of the consultants and extensionists indicated that they have no specific clientele group that make use of their irrigation scheduling service. Business-oriented people are in general more self-reinforcing and will often seek and participate in further learning opportunities. Since the adoption of objective irrigation scheduling methods often require a significant amount of

technical understanding, training and preparedness to learn about the alternative scheduling method is essential. It is clear from Table 19.3 that the majority of clients (64%) involved in the use of irrigation scheduling services offered by consultants, belong to a group of more business-oriented farmers, and/or professionals from various occupations outside agriculture that are starting irrigation farming and/or are involved in the production of high valued, intensive crops. These findings are in agreement with Hypothesis 3, namely that the business context and general approach of the farmer towards farm management and technology determine his approach to the use of precise irrigation scheduling.

Table 19.3 also illustrates that a relative low percentage (8%) of corporative or estate farming concerns do make use of irrigation consultants. This could be due to the fact that many of the corporate farming concerns often appoint their own irrigation experts to address this need.

19.8 IDEAL NUMBER OF CLIENTS

Interviewees were asked to indicate the current number of clients they are servicing and these findings are reflected in Figure 19.2.

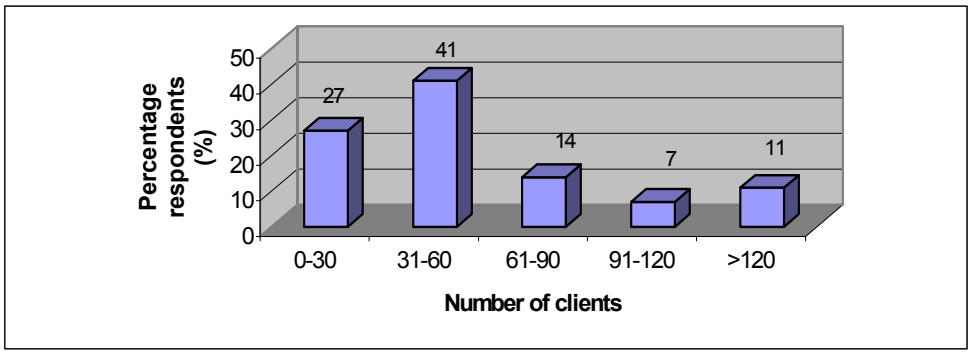


Figure 19. 2: Percentage distribution of respondents according to the number of clients served (N=37)

The majority of consultants (68%) have a clientele group of 60 farmers or less (Figure 19.2). Although all of the consultants have indicated that a certain threshold number of measuring points or tubes are necessary to offer a cost effective service, the consultants that service a bigger number of farmers also admitted that they could not consult and visit farmers as regularly as needed. The consultants involved in servicing the larger number of farmers often use "runners" or other staff to measure and supply the data to them, which are then analysed by the consultants themselves. The fact that these consultants make use of supporting staff to measure the frequency of personal and regular consultation with their clients also decreases. In general farmers expect to have regular contact with consultants, even if the time scheduled for meeting is very limited.

19.9 PROFILE OF SERVICE DELIVERY BY IRRIGATION CONSULTANTS

Important for the effective delivery of irrigation scheduling services is the regularity that the soil water content status is monitored and the relative time span between the collection of raw data and the provision of recommendation for decision-making by the farmer. Fifty four percent of the consultants interviewed have indicated that they measure soil water content every week, analyse the data and submit recommendations to farmers within 24 hours after taking the measurement. This group of consultants also indicated that they usually consult farmers every fortnight at which stage field visits and observations often form part of the consultation. Thirty one percent of respondents also indicate that they measure weekly, but consult and make recommendations on the same day that the soil water measurements are recorded.

Irrigation consultants involved with irrigation scheduling of permanent, high valued horticultural crops like deciduous fruit, table grapes, etc. reported regular measurements of the soil water content on a weekly basis during the peak growing season, but will often scale down to even once a month during the winter periods or dormant season. The minority of consultants (16%) still

measure every second week, with analyses and recommendations provided within 24 hours after measurement.

19.10 REQUIREMENTS OF AN EFFECTIVE IRRIGATION SCHEDULING CONSULTANCY

Irrigation consultants identified key attributes and competencies imperative for the rendering of effective irrigation scheduling consultant services. These range from personal attributes like interpersonal communication skills to technical knowledge, expertise and ethnical competence as indicated in Table 19.4.

Table 19. 4: Competencies and personal attributes perceived by consultants necessary for delivery of a successful irrigation consultancy (N=37)

Attributes and characteristics for effective irrigation consultancy	Number of respondents (n)	% Respondents
1. The software selected by consultants, must be appropriate, accurate and relative easy to understand by both the consultant and the farmers	19	52
2. Consultants should have appropriate education, knowledge, skills and work experience to ensure credibility and the ability to interpret the measured data	16	42
3. Show commitment, persistence and focus on achieving the objectives as set together with farmers	10	26
4. Be service oriented and open minded, observant, and versatile in the recommendations to accommodate the different situations of farmers and farming systems	7	19
5. Consultants must show good communication skills and be able to listen and interface effectively with farmers	6	16
6. Consultants should show good common sense and be realistic in the approach they apply and combine it with good time management	6	16
7. Apply sound sale techniques in approaching new clientele: farmers need to buy into this new innovation	6	16
8. Display good computer skills	5	14

Fifty two percent of the respondents perceive the use of a correct and appropriate software program as a very important requisite for the delivery of an effective irrigation scheduling service (Table 19.4). Many of the consultants referred to the use of inappropriate software programs in the past that have cost them dearly in terms of clients that were unsatisfied with their services and consequently terminated the service. The perceived usefulness of an irrigation scheduling program or model used by irrigation consultants is an important consideration that was identified by irrigation farmers in Part Three (Chapter 9).

Forty two percent of the respondents identified the importance of appropriate technical qualifications and experience as prerequisites for an effective irrigation consultancy service. The credibility of the person providing the service was identified to be very important in terms of the adoption of irrigation scheduling services. Credibility is often regarded as a combination of trust, competence and integrity usually developed over time between a client and a consultant. Many of the consultants referred to the fact that they took over from another consultant because of certain personality clashes between the farmer and the specific consultant or due to the lack of the necessary skills and experience to interpret data correctly. Consultants identified attributes like service orientation, good personal communication skills, adequate computer skills, commitment and the general application of common sense to be important for successful engaging with irrigation farmers and managers. These key attributes and competencies identified through the interviews supply evidence in support of Hypothesis 4, namely that competent ground level support is a necessity for the implementation of irrigation scheduling practices.

Sixteen percent of the respondents were of the opinion that it is important to apply some of the basic skills and techniques that salesmen and representatives often use, to enable irrigation farmers to “buy into “ the use of irrigation scheduling on the farm.

19.11 PERCEIVED REASONS OFFERED BY CONSULTANTS AS TO WHY FARMERS ARE NOT MAKING USE OF IRRIGATION SCHEDULING

Respondents were asked to provide possible reasons why some farmers are not interested in the use of irrigation scheduling services and objective irrigation scheduling *per se*. The following responses of consultants in this regard are reflected in Table 19.5.

Table 19. 5: Reasons, as perceived by consultants, why farmers fail to make use of objective irrigation scheduling (N=37)

Reasons for farmers not scheduling as perceived by consultants	Number of respondents (n)	% Respondents
1. Consultants lack the necessary skills to interpret measured data into some information that could be use for decision making by the farmer	18	49
2. Not all farmers are aware of the potential benefits of irrigation scheduling	16	43
3. Cost of water relatively low compared to other production input costs, and therefore is a relative low priority to farmers	14	38
4. Farmers perceive objective irrigation scheduling in general as complicated and difficult	11	30
5. No financial incentive exists for the farmer because of flat tariff structure of water	10	27
6. Lack of flexibility (irrigation system or water delivering) prevents farmers from applying irrigation scheduling	10	27
7. Attitude of farmers negative towards the use of irrigation scheduling	8	22
8. Farmers confused because of divergent recommendations and messages received from irrigation advisors and consultants	8	22
9. Farmers do not appreciate the fact being prescribed and told what to do on the farm by an “outsider”	8	22
10. Farmers are hesitant to adopt irrigation scheduling due to bad experiences in the past with especially devices like tensiometers	8	22
11. Cash crop growers in general do not use real time irrigation scheduling but rather prefer general guidelines and irrigation calendars	7	19

Forty nine percent of consultants expressed their concern about the fact that many of the consultants operating in the irrigation fraternity lack the ability to interpret the data measured for purposes of decision-making (Table 19.5). Information like the soil water content of a specific field only becomes an economic valuable commodity in the context of decision-making once the raw data is interpreted. Forty three percent of the respondents are of the opinion that some farmers are still not aware of the potential benefits of the use of irrigation scheduling except for conserving water.

19.12 PROMOTING IRRIGATION SCHEDULING

Respondents were asked what aspects they perceive to be important to be included in a possible communication strategy to raise awareness amongst farmers and motivate them to become interested to implement objective irrigation scheduling on the farm.

Table 19.6 lists the aspects of irrigation scheduling taken into account by farmers before a decision is taken regarding the implementation of a specific irrigation scheduling method on the farm. It shows that the majority of respondents (64%) are of the opinion that the incentive for adopting irrigation scheduling should not only be the potential conservation of water, but rather the improvement of efficient water-use on the farm. The findings from the semi-structured interviews held indicate that the possible reasons why producers adopt the use of more sophisticated irrigation scheduling methods are usually combinations of the following:

- To ensure a high quality of crop.
- To save energy especially where water has to be pumped a considerable height or distance.
- To increase production yields of crops.
- To improve profitability through saving of especially nitrogen.
- To conserve water and to reduce pollution (saline conditions).

Table 19. 6: Aspects or essential elements regarding irrigation scheduling used by irrigation consultants to persuade farmers (N=37)

Aspects and potential benefits regarding irrigation scheduling	Number of respondents (n)	% Respondents
1. Irrigation scheduling must not be offered as saving of water but rather as the improvement of water use efficiency	24	64
2. Illustrate the possible saving of electricity and energy costs	18	48
3. The irrigation scheduling program or recommendations should be offered in terms of the whole farm management	16	43
4. Improvement of production yields and net profit	12	32
5. User friendly and easy to understand irrigation scheduling program or software	12	32
6. Possible saving and controlling of fertilisers – prevent leaching of fertilisers	9	24
7. Manipulation or management of the ratio between oxygen and water in the root zone	8	22
8. Improvement of quality of crops	7	19
9. Financial incentive for a farmer who implements irrigation scheduling like for instance differentiated water tariffs	6	16
11. Saving on maintenance of moveable irrigation systems (centre pivot)	5	14
12. Irrigation scheduling should serve as prerequisite for the access to production credits at cooperatives	5	14
13. Prevention of salinization/sodicity	2	5

Thirty two percent of the consultants regard the need for a user-friendly and understandable irrigation scheduling program as an important necessity for irrigation farmers to be willing to "buy into the implementation of an alternative irrigation scheduling approach".

The general feeling amongst 22 percent of the respondents is that a code of conduct should be developed, especially with regard to intellectual property and information management. Thirty three percent also indicate that a form of

accreditation might be useful to guarantee the quality and standard of work of irrigation consultants and advisors operating in irrigation management.

19.13 SUMMARY

The semi-structured interviews with irrigation consultants and extensionists revealed the following:

- All the irrigation consultants indicated their competency in the use of computer programs and software to collect data from soil water measurements, but only 46 percent of them received formal agricultural training. The respondents expressed their concern about the fact that many of their fellow consultants operating in the irrigation fraternity, lack the ability to interpret the measured data for the purposes of decision-making.

- It is generally accepted that competence alone explains only part of the variation regarding the ultimate impact of irrigation consultation. Another major factor is the credibility of the person providing the service, which is often regarded as a combination of competence, trust and integrity. Consultants and farmers identified credibility to be very important in terms of changing the adoption behaviour of irrigation farmers.

- The need to uphold certain professional standards in consultancy and communication intervention with irrigation farmers was emphasised by many irrigation consultants as well as irrigation farmers. However, the problem is that no nationally accepted “code of conduct” exists in this respect.

CHAPTER 20
THE POTENTIAL ROLE OF INSTITUTIONS AS LEARNING SYSTEMS IN THE PROMOTION OF EFFICIENT WATER USE PRACTICES

There is little empirical evidence about the rate at which farmers become aware of new practices and innovations. Once a farmer becomes aware of or shows interest in an innovation or a new practice, he will collect all relevant information on that particular practice. Education and training were identified in Part Four (section 9.2) to play an important role in raising awareness among irrigation farmers regarding alternative scheduling practices and the potential of adopting such practices. Schön (1967) was one of the first wave of thinkers that argued that a 'learning system or network" is necessary to adapt to the continuous process of transformation that we experience.

In Part Three it was illustrated that the adoption of an innovation like irrigation scheduling is not only relating to an individual, but that it has a composite nature which includes technical and social practices at different domains and levels of farming, at different times. In order to meet these challenges, various actors like the Water Users Association (WUA) could play an important role as a "learning system" in the raising of general awareness amongst the irrigation farmers. It is expected of a WUA to plan and develop operational rules for a specific irrigation scheme in participation with the users, as implementers of Water Demand Management (WDM) through the development of a Water Management Plan (WMP). These aspects will also include irrigation water allocations to users and the administrative system to operate it. This collective planning of a WMP for an irrigation scheme was perceived by the research team to serve as an ideal opportunity to make irrigation farmers aware of certain principles of efficient water management on-farm. With these functions in mind the perception of respondents regarding the possible role that WUAs could play as a "learning system" was tested on a ten-point semantic scale (0= not important; 10= very important) and is illustrated in Figure 20.1.

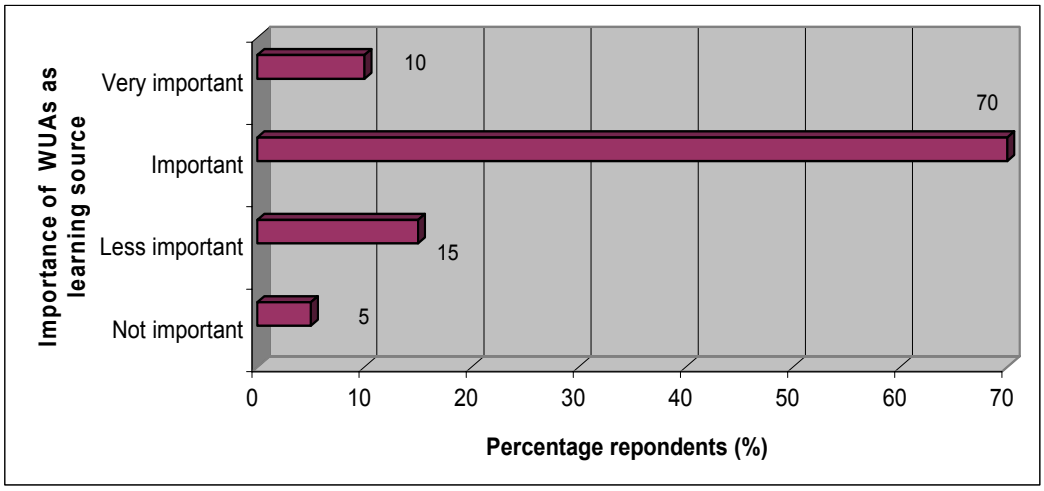


Figure 20. 1 Percentage distribution of respondents according to their assessment of the potential role of Water User Associations (WUAs) in promoting awareness of irrigation scheduling (N=137)

The majority of respondents (80%) were of the opinion that the WUA could and should play a more definite role in promoting awareness and the adoption of irrigation scheduling and efficient water use on the farm. WUAs should be evaluated in terms of the role it could play as part of an integrated knowledge network system in providing opportunities and an environment for social learning and building of "relationship capital" with farmers (van Woerkum, 2002).