Programme Commun Système Irrigué (CIRAD – Cemagref)

TECHNICAL AND SOCIO-ECONOMIC CIRCUMSTANCES OF FAMILY FARMING SYSTEMS IN A SMALL-SCALE IRRIGATION SCHEME OF SOUTH AFRICA (NORTHERN PROVINCE)

Historical analysis, diagnosis and prospects in a context of rehabilitation and irrigation management transfer

SYNTHETIC REPORT

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Abstract

This study has been carried out in two irrigation schemes of the Northern Province (Dingleydale and New Forest) of South Africa. The studied area takes place in former homelands areas (Lebowa, Gazankulu). This region is submitted to a sub-tropical climate. The infrastructures were built during the apartheid era, in order to provide employment and food to the local black population. Currently, the farmers crop from 1 to 10 hectares, producing maize in the summer and vegetables, mainly in winter.

Following the National Water Act of 1998 and its new institutional frame, the South-African government tends currently to withdraw from its ownership and commitments in small-scale irrigation schemes. Ownership, management and maintenance of infrastructures are to be transferred to farmers (Irrigation Management Transfer process). In the Northern Province, this process has started in several pilot schemes. It includes the rehabilitation of infrastructures before transfer and the establishment of farmers' Water User's Association, which are to take over ownership and collective management of the scheme. This study has been carried out in collaboration with the consultant team in charge of the ITM project.

The report first considers the evolution of the agrarian system during the 20th century. It shows declining soil fertility, due to the increasing disconnection between agriculture and cattle rearing, and to the remoteness of the cultivated plots.

Then, the diversity of the farmers' situations has been highlighted through the use of typological techniques. Nine household types have been identified within the schemes, and thorough economic analysis has been carried out. Particularly, some vulnerable types of farmers have been identified, whose plight might worsen after the transfer. On the other hand, efficient and dynamic farms have also been detected. They might become bigger and more integrated within commercial circuits.

The management of water distribution has also been studied. It reveals a lack of both discipline and organisation. This might slow down the project's development, and, ultimately, jeopardize the scheme's sustainable management. Finally, the study of neighbouring communities has highlighted the gap between this social and economic environment and the scheme itself. The latter have long received subsidies and guidance, while communities have been left without any kind of support whatsoever, and display poverty and unemployment features.

This study has been carried out between March and August 2000.

The full original report has been written in French. It is available on request, from Dr. Perret:

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Original report:

Merle, S & Oudot, S. (2000) *Stratégies, systèmes techniques et situations économiques d'exploitations agricoles familiales dans un perimètre irrigué d'Afrique du Sud. Diagnostic et perspectives dans un contexte de réhabilitation et de transfert de gestion.* Mémoire de fin d'études INA-PG, rapport PCSI, October 2000, 120p & annexes.

Disclaimer: This synthetic report must be seen as a work document, which statements and conclusions remain discussable. Should the following text raise any comments, or generate misunderstandings, the reader is most welcome to express constructive comments and reactions.

Acknowledgements, from S. Merle & S. Oudot

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1. Introduction

1.1. The water issue in South African: a new context

In South Africa, rain falls unevenly across the country, with humid, subtropical conditions occurring in the Eastern lowveld and dry, desert-like conditions in the West. The most important factor limiting agricultural production is water availability. Almost 50% of South Africa's water is used for agricultural purposes. Numerous irrigation schemes are found in South Africa. They belong to two very different types:

- ✓ in the former white areas, large schemes composed of large holdings, integrated in commercial circuits,
- ✓ in the former homelands, smaller schemes with small-scale farmers. These schemes were built during the apartheid era to provide employment and food to the local communities. These schemes have been government-owned, subsidised and supported until recently.

Water availability prospects at Nation level are quite concerning, in terms of quantity and quality. This is why the South-African government is implementing a water reform. The new National Water Act, voted in 1998, establishes new water regulations and defines the basis of sustainable water management. The main institutions created by the new law are:

- Catchment Management Agencies, which will be responsible for water management at large water basin level (*e.g.* partition of water between the different users...). The implementation of these agencies will not be effective before several years, even though some pilot catchments are already engaged in the process.
- Water Users' Associations that groups of farmers have to form at scheme and community level. Those WUAs are to take over ownership and management of their schemes. Farmers themselves will now face the water service and maintenance costs. This withdrawal from the public operators is likely to be progressive. A transfer process is currently implemented in several pilot schemes of the Northern Province, under the co-ordination of the provincial Department of Agriculture (Irrigation Management Transfer –ITM-). With community participation as background, it aims at (1) upgrading the infrastructures, (2) establishing local water management entities –WUAs-, (3) accompanying the transfer with training, technical advice, *etc.* This study takes place within this process.

The National Water Act hardly affects the schemes in the former white areas, because the farmers are already organised, registered and independent (former Water Boards become easily WUAs). It should be trickier in the former homelands, where different governmental departments have long supported the schemes (*i.e.* through infrastructures build-up and maintenance, water distribution management, subsidies on water –basically free-, technical advice, *etc.*). The transfer of management and State withdrawal will be much more complicated in these areas:

- The schemes are very small and numerous, most are not at optimal operating conditions (damaged infrastructures). There are 171 of them in the Northern Province.
- The situation on these schemes is worrying, decreasing governmental subsidies and the withdrawal of parastal organisations since 1990 have led to declining agricultural activities.
- Farmers and rural households will have to face a very new situation, in which they will have to manage and to make decisions collectively, and, most probably, to pay for water, whereas management skills, local organisations, production means, cash, *etc.* are lacking.

Still, these schemes allow numerous rural households to make a living, through subsistence farming. In spite of the above restrictions, they often look like islands of productivity in much more disadvantaged areas. Thence, the success of the ITM process is of greater importance, socially and economically.

This study aims at answering the following questions with regard to this process, through a local case study in the Northern Province (Dingleydale and New Forest schemes):

- ✓ What is the social and economic situation of the schemes? What are the technical problems?
- ✓ What are the needs in terms of water? What are the problems concerning water distribution?
- ✓ What are the technical and economical achievements in the production systems? What are the existing or potential markets?

1.2. Aims and methods of the study

Before a large-scale transfer of the Northern Province's schemes, three pilot projects have been implemented in 1999, and eleven other schemes have been chosen for a second phase of the project in 2000-2001. Dingleydale-New Forest has been chosen amongst those schemes for its size (1500 ha under furrow irrigation). This study has been carried out in collaboration with LVA, the consultant team in charge of performing the project.

The study is composed of:

- ✓ the description of the scheme's history and institutional environment, in order to highlight the present situation.
- ✓ then, individual and collective interviews lead to :
  - a comprehensive representation of the scheme in its environment : markets, villages...
  - a description of water distribution and management features
  - a typology, which is a synthesis of the farmers' situations. This technique is useful to understand the diversity of the farmers' situations. Detailed economic results accompany the typology.

2. Presentation of the studied scheme

2.1. Location, climate and soils

The scheme is located in the southern part of the Northern Province, between the Drakensberg Escarpment and the Kruger Park (see map in annexes). Dingleydale was part of the former Lebowa homeland, and New-Forest was part of the former Gazankulu homeland. Two rivers provide irrigation water. The scheme is surrounded by three medium-sized towns (Acornhoek, Bushbuckridge and Thulamahashe) where most of the crops are sold. Two larger distant towns, Hoedspruit and Hazyview, located in the former white areas, play an important role for the input supply (fertilisers and pesticides).

The climate is sub-tropical, frost-free, with an average annual rainfall of 700 mm. It displays two main seasons: one humid and hot in summer, from October to March, and one cooler and drier in winter, from April to September. The average temperature in summer is 25°C and 17°C in winter.

The subsoil is made of gneiss, and the soils intended for irrigation are moderately deep, sandy to sandy-clay. The granitic subsoil leads to moderately acid soils, which decreases nutrient availability. The water-holding capacity is estimated to 65 cm to 100 cm, which is appropriate for irrigation.

2.2. Sequence of the agrarian systems until apartheid era

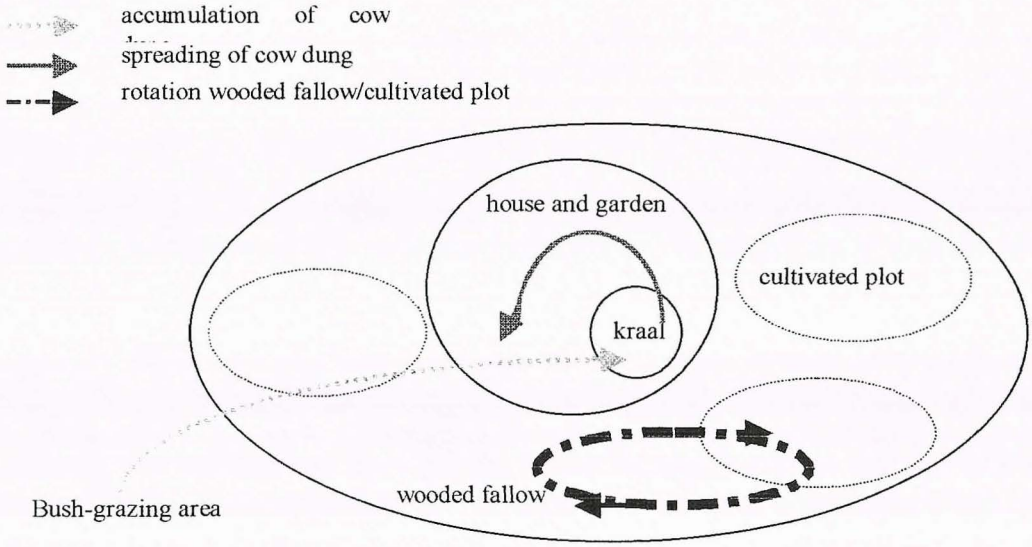
2.2.1. First agrarian system, before colonization

Until the XIIIth century, the area was only inhabited by San hunters-gatherers (Bushmen). Then, waves of Bantu migrants arrived from the east of Africa and ousted the San. They brought with them agricultural and breeding knowledge, as well as iron working techniques. They settled in scattered houses surrounded by gardens and orchards. Beyond these stretched the cultivated areas, with a rotation of cultivated plots and wooded fallow. Sorghum and millet were cultivated. Even further was the grazing area, where the cattle grazed during the day, under supervision of young shepherds. During the night cattle slept in enclosures close to homesteads, the *kraal*. Cattle manure was collected from the *kraal and* used to fertilise gardens. Still, a large part of food was gathered directly from the bush.

Land was formally owned by the chief, who allocated plots to the families, and more particularly to each woman to enable her to feed her children. A plot was often passed on from a woman to her daughter-in-law.

Figure 1. represents the local land use and fertility management features during pre-colonisation era.

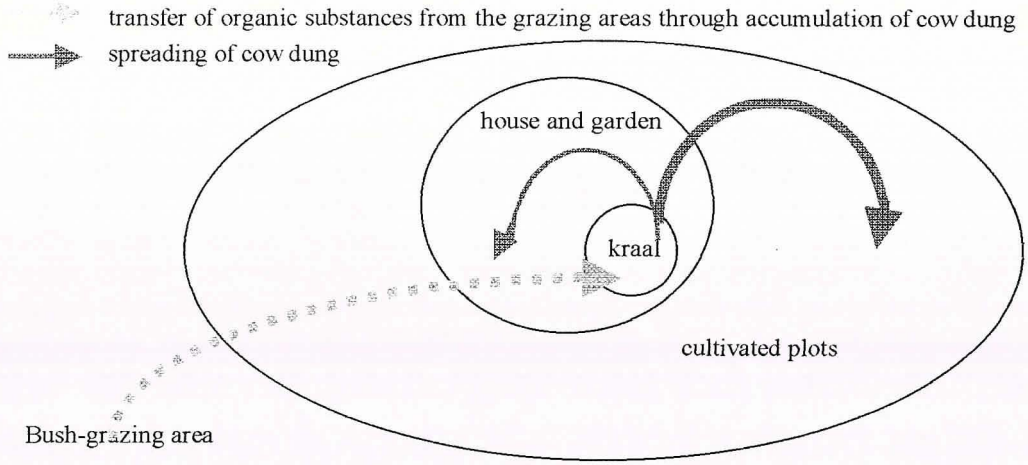
Figure 1. Representation of local land use and fertility management features during the pre-colonisation era.



2.2.2. Colonial system

During the XIXth century, white settlers arrived with new agricultural techniques, which they taught to local populations. The use of draught animals led to deep changes in the regeneration of soil fertility. The use of iron ploughs and the spreading of cow dung on the fields aided by cattle-drawn sledges allowed permanent plots to be cultivated. The cultivated areas formed circles around homesteads and gardens. Maize, groundnuts and pumpkins were cultivated together on the plots. However, these new practices spread slowly, and wooded fallow could be seen throughout the first part of XXth century.

Figure 2. Representation of local land use and fertility management features during the XIXth century.



This system existed until 1965, when the apartheid policy was implemented and the irrigation scheme was created.

How can the past help the present ?

The apartheid policy deeply disrupted the agrarian and social system. However, some practices and beliefs have survived, and being aware of them is important for the development projects.

The transmission of the plots: we can still see woman-cultivated but man-owned plots. It is particularly important to take this into consideration in future land reform bills.

The importance of organic fertilisation: the use of cow dung as a fertiliser is quite recent. The settlers arrived in the middle of XIXth century, and these methods have not spread rapidly. Some people still do not recognise the utility of this kind of fertilisation.

Intercropping. Both extension services and research currently tend to promote mono-cropping systems. Advantages of inter- and mixed cropping systems should however be taken into consideration for small-scale developing farming.

Food and materials from the bush: people used to collect a lot from the bush. The population increase caused by the apartheid policy led to the degradation of the bush and to the exhaustion of natural resources.

Animal draught: Despite official watch-words strongly promoting motorisation, animal draught has persisted, up until now (ploughing and transport).

2.3. Creation of the scheme

2.3.1. A new landscape

The apartheid policy defined three land use patterns in order to prevent land degradation: the residential area, the arable land, the grazing land. This programme was called the Betterment Planning.

The scattered houses were destroyed and people gathered in villages. Most villages in the area were assigned to cattle farming because of the irregular and scarce rainfall. Crops were forbidden. On the other

hand, the five villages within the scheme were assigned to irrigated crops. The farmers could not keep more than 5 heads of cattle per household or hold any other kind of job.

The construction of the canals began in 1963 and the first plots were cultivated in 1965. Every applicant (often workers in the scheme's construction) received a 1 ha plot. Each residential site on the scheme had a corresponding arable plot. Waves of migrants from the white areas arrived in the scheme, and vacant plots were available until the 80's.

2.3.2. Management of the scheme

The difference between the villages in the scheme and the other villages in the area is not only due to the irrigation network. On the scheme, the agricultural activities were closely controlled and monitored by the Department of Agriculture. The government took responsibility for the maintenance of the infrastructure and brought large-scale support to the farmers (input supply and mechanisation).

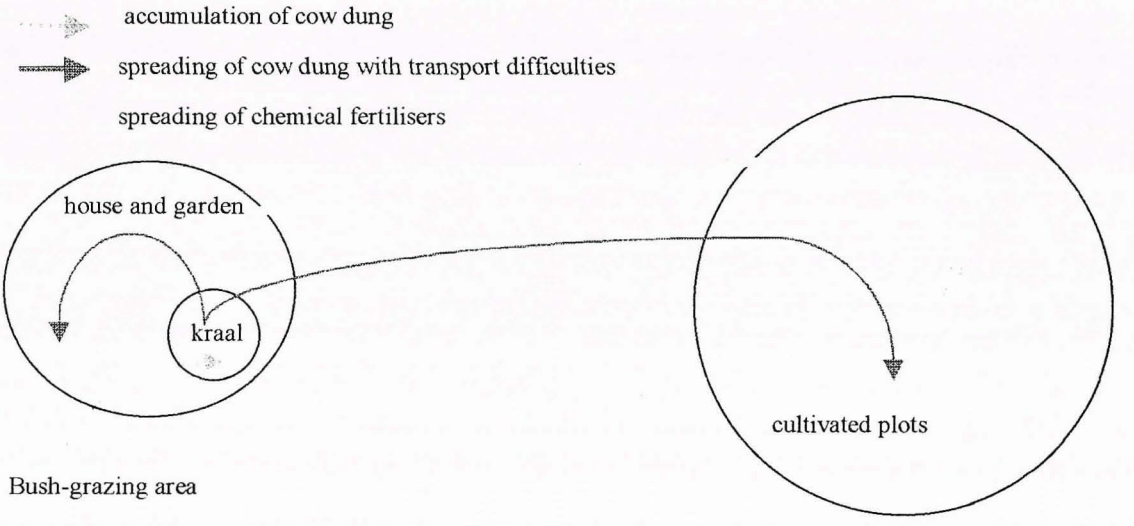
From then on, the land belonged to the government and the allocations were under the control of the Department of Agriculture, even if the Tribal Authority kept a veto on the decisions. The PTO system (Permission to Occupy) allowed a plot to be allocated but also to be confiscated if it was not properly cropped (see the current plot allocation procedure described in annex).

The government employed water bailiffs in charge the water distribution as well as a maintenance team. The extension officers brought technical support. The same officers arbitrated conflicts concerning water. A governmental co-operative provided mechanisation services and inputs at a subsidised price. The new farmers sometimes had no farming knowledge, and the training provided by the extension officers was essential. In reality, the extension officers made all the agricultural decisions, and the farmers just carried out the operations.

2.3.3. Cropping practices

The set-up of the irrigation network allowed two crops per year. In summer the farmers cultivated food crops (maize, groundnuts, njugo beans, pumpkins), and vegetables in winter (tomatoes, beans, onions...)

Figure 3. Representation of local land use and fertility management features after the schemes' creation



The new agrarian system contains elements that lead to a decreasing soil fertility

Declining number of cattle on the scheme led to a decreasing quantity of manure spread on cultivated plots, whereas the doubling crop production increased the export of mineral elements. Sometimes the distance from kraal to plots was so large that farmers gave up using cow dung, and shifted to chemical fertilisers. Moreover, frequent ploughings sped up humus mineralisation. Lastly, if furrow irrigation is not monitored properly, mineral elements may be washed away.

The long-term consequence is a decreasing soil organic matter content. This degradation of soil fertility has gone unnoticed because of the large quantities of chemical fertilisers spread.

Creation of the homelands

In 1972, the creation of the Lebowa and Gazankulu homelands led to further population movements. As homelands were based on ethnic differences, some families were forced to move away. These upheavals allowed some influential farmers to occupy the newly vacant plots. This was the only way to accumulate land until the 80's.

2.4. Degradation from 1985

The hydraulic and agricultural administration system became more flexible from 1985. These alterations have resulted in the disappearance of common rules on various subjects: land allocation, water distribution, and also basic community topics. Moreover, the withdrawal of the State led to the decrease of government subsidies, and therefore to the suppression of supplies, training and maintenance services. The farmers have been quite distraught by this withdrawal, because they were used to constant support.

2.4.1. Society organization

The lifestyle wavers between tradition and modernity. Most of the families are nuclear, but some kind of extended families remains, with polygamous households linked by underground relations. The *lobola* system lingers on very strongly.

Furthermore, the average age of heading farmers is high (approximately 60 years old), and a large number of them receive a pension of R 500 per month. Very few young people seem to be interested in agriculture. Deviant behaviour of young people, such as drugs, alcoholism and crime, causes constant insecurity and frightens the population. Agricultural theft is a big problem: products disappear from fields before ripening, which encourages practices such as the sale of green maize or green mangoes for achaar.

2.4.2. Land organization

Nowadays, the organisation of space does not strictly respect the Betterment Planning anymore. Population rises and inward migrations led to a settlement densification and to an expansion beyond the administrative boundaries, at the expense of grazing areas. Inhabitants of the villages within the scheme are no longer only farmers, but often work in distant towns.

Some farmers, in the scheme and in other villages, have illegally cleared dry land plots in areas initially dedicated to animal grazing or in-between irrigated plots. There were not sanctions. Moreover, some plots formerly cropped are today excluded from the arable area because of erosion or waterlogging.

2.4.3. Scheme management

Because of budget restrictions, the government services have disappeared one after another. Cancellation of mechanisation and input supply services has increased the production costs of farmers who must now use private operators. Some of them have reduced the quantity of fertilisers spread on their plot or do not use them at all anymore. Others had so many financial difficulties that they stopped cropping and let their plot lie fallow. One can estimate that only 30% of the scheme is cultivated in summer, and 15% in winter. But the PTO owner often does not want to give up his/her plot because he/she will receive no compensation for the loss of the plot. This also refers to risk-aversion behaviour (the plot might be a resort to sustain livelihood if the household come across major setbacks).

The budget of the maintenance team was also reduced, and the infrastructures are in very bad condition today. Fences have been stolen, and cattle stray into the plots.

State withdrawal also leads to the disappearance of management and society rules.

- The number of cattle increases without control, causing damage to the crops and overgrazing of the bush.
- The collection of firewood is not controlled either, to the expense of the trees.
- Water distribution rules are no longer respected. Some farmers take water from the canals when it is not their turn, others steal water to irrigate illegally newly cleared plots, and other farmers have built small reservoirs at the end of canals, where plots are waterlogged, and fill them illegally.

The fertility crisis comes to light

The higher price of chemical inputs makes them unaffordable for numerous farmers. The quantities spread on the fields are decreasing.

The fertility degradation is due to the poor organic fertilisation since the beginning of the scheme. But this impoverishment has only become obvious now because of the recent decline in chemical fertilisation.

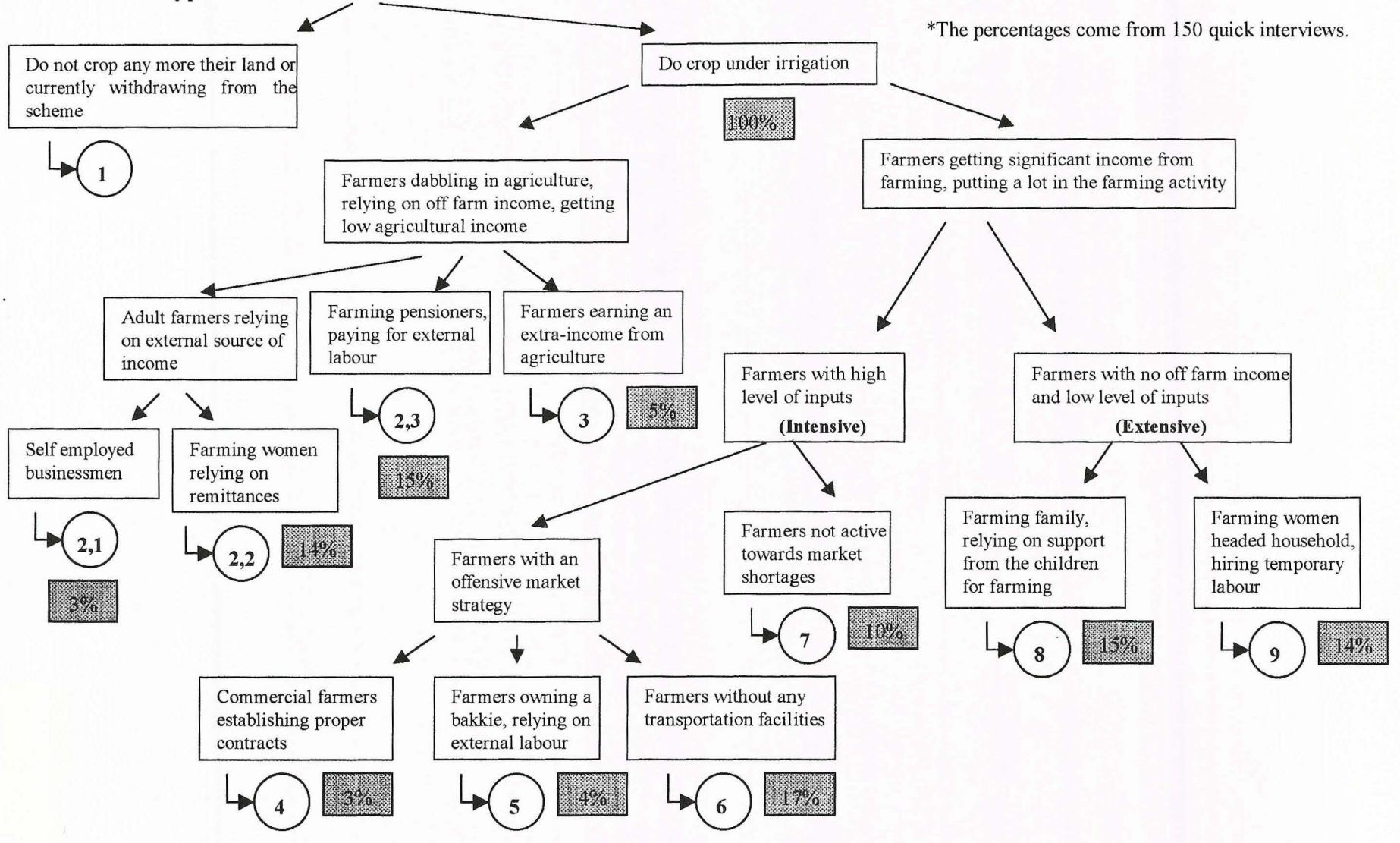
2.4.4. Access to markets

Market opportunities have been reduced: the tomato factory in Hoedspruit which was the main outlet of the scheme's tomatoes closed in 1990, and railway facilities were no longer available since the 1970's. Today, farmers face great difficulties to sell their products. The nearby markets are the main outlets, but the poor quality of the scheme's products drives shopkeepers to buy their vegetables from distant areas.

The typology is an attempt to give a structured representation of the above information. The following sketch provides keys for the reader to identify the main features of each farm type identified. Thorough economic analysis has been carried out within each type. Data are not reported comprehensively in the present report. Synthetic features are shown in a following table.

3. *farmers' typology and economic results*

3.1. Types of farmers



Many farmers do not earn a lot from their agricultural activity. The table below explains their situations.

TYPES	N°
Types who abandoned the agriculture activity or do not earn much from their agricultural activity in the scheme	
Farmers who do not crop (represent more than 50% of the scheme)	**1**
Extensive or intensive farmers who do not earn anything from their agricultural activity. ✓ business men who consider agriculture as a hobby ✓ women whose husband is working, they consider agriculture as an insurance and as a social activity ✓ retired farmers, who cannot live without farming	**2,1** **2,2** **2,3**
Extensive or intensive farmers who earn an extra income from their agricultural activity	**3**

3.2. Economic results

Type		Maize yield *Q/ha*	Income per ha *R*	Share of agricultural income in total income (%)	Share of garden-related income in the agricultural income (%)	Share of livestock-related income in agricultural income (%)
4	**Intensive and equipped farmers, on larger areas (3 to 10 ha), with tractor and bakkies**					
		28	1211	23 %	1 %	29 %
5	**Intensive and equipped farmers, on larger areas (3 to 10 ha), with bakkies**					
		26	985	41 %	6 %	33 %
6 et 7	**Intensive farmers, covering various situations, from 1 to 3 ha**					
	6	*Active towards markets*				
		23	657	29 %	24 %	11 %
	7	*Inactive towards markets*				
		30	1006	40 %	13 %	25 %
8 et 9	**Extensive farmers, who cannot afford to buy inputs after the State withdrawal, on 0,5 to 1 ha**					
	8	*Families*				
		10	920	32 %	11 %	26 %
	9	*Single women*				
		12	687	36 %	19 %	14 %
Dry land	**Farmers of surrounding villages, cropping on rain-fed plots**					
		8	916	29 %	39 %	14 %

4. *Water matters*

4.1. Advantages and disadvantages of the infrastructures

4.1.1. Upstream resources

The rivers form their water resources in the mountainous area of the Klein Drakensberg. That is why their flows are irregular, and vary according to seasons and to years. The low water month records a 0,35 m^3/s flow, and the high water month records flows until 15 m^3/s.

The flow has to be divided between different users :

- The natural rate of flow of the river has to be maintained in order to protect aquatic ecosystems. The Instream Flow Requirements, elaborated by a specialists' team, have to be respected.
- Domestic and animal users have priority on the agricultural ones. In Dingleydale and New-Forest, the canals are used for domestic water supply. People and cattle cause damages to the canals, which leads to farmers' discontent.

According to hydrologists, one can forecast the available volume of irrigation water six month in advance. This could allow the farmers to plan collectively the cultivated area in order to avoid water shortages.

4.1.2. Well designed but deteriorating infrastructures

Two stocking dams allow regulation for the seasonal flow variability. Numerous night storage dams allow to limit the size of the canals. Regulation works allow a precise control of the flow for several adjoining plots.

The canals are however in a very bad condition, due to severe budget restrictions. The project plans rehabilitation works, but all secondary canals will not be repaired.

4.2. Adequacy between supply and demand

4.2.1. Water consumption in the plot

Agricultural engineers estimate the average irrigation-water demand for crops at 20 mm per week. But field measures reckon the average consumption to be less than 16 mm per week. The yields are lower than in usual conditions, which can explain the difference between estimations.

Furthermore, a lot of plots are not cultivated, which lessens the water demand at scheme level. The winter demand is even lower.

We elaborated a scenario for irrigation-water demand in the present situation. The needs are calculated for 21 mm of water (16 mm for irrigation and 5 mm for losses).

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sept
Cultivated area (ha)	350	325	250	175	150	75	225	225	175	125	200	250
Irrigation water needs (millions of cubic meters)	0.29	0.26	0.21	0.16	0.14	0.07	0.2	0.2	0.16	0.11	0.17	0.2

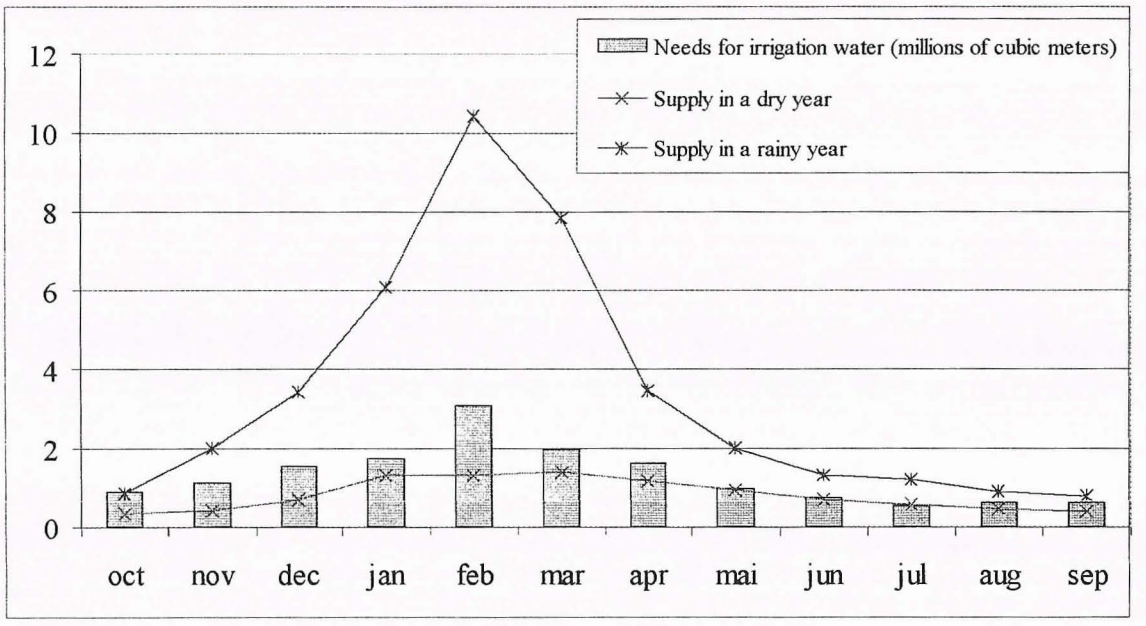
4.2.2. Hydrological models

Considering these data, we used a hydrological model to compare supply and demand. This model has been developed by the ARC.

To interpret the results, one have to keep in mind that the soil has a storing capacity of one month. We found out that:

- the Instream Flow Requirements (ecological reserve) are not always satisfied, especially during summer.
- Irrigation water shortages are particularly tricky in spring, which correspond to the farmers' observations. The soil storing capacity and stocking dams contribute however to soften shortages.

The river behaviour is represented on the diagram below. The demand curve follows the supply with a peak in February. During a dry year, demand is over supply and there is no possibility to fill the stocking dams. If the previous year was rainy, the season begins with a full dam after the rise of the water level, which allows to postpone the shortages till October - November. Otherwise, shortages can appear from August.



This gives rise to arguments for the reflection on the regulation of the cultivated area :

- ✓ If the dam is empty in August but that one forecasts higher flows afterwards, short-cycle variety can be recommended.
- ✓ If the dam is full but the forecasts pessimistic, the cropping area has to be reduced and the high-value crops recommended.
- ✓ If the dam is empty and the forecasts pessimistic, rain-fed crops can be recommended.

4.3. Water distribution rules

4.3.1. Feeding the night storage dams

The distribution rules are no longer written as the program has been lost. Even the water bailiffs fail sometimes to remember the time of opening and closure of the valves. In Dingleydale, the program is not respected in time of shortages because farmers open or close the valves during the night and

distribution has to be readjusted during the day. These "free-riding" behaviours apply at individual level (irrigating one's plot), as well as at ward level (filling up a dam). When there is sufficient water, water bailiffs make arrangements between themselves in order to feed the dams. In New Forest, the unwritten distribution rules are much more respected.

4.3.2. Sharing water between farmers under a dam

Dams have usually two or three outlets, and the distribution rules vary from an "early bird" style (early or night irrigators get water first), to established priorities according to the level of the different valves (the upper valves are served first). An accurate schedule must have existed once because the farmers interviewed know the days and hours they can irrigate, even if it is not respected. The farmers experience shortages every year, they are often unable to irrigate during several weeks. Being close to the dam or in the first branches confers a real advantage as far as access to water is concerned, especially when the relations between farmers are tense. Some remote plots from the dams do not receive water at all.

Some farmers built unofficial reservoirs at the end of the small canals in order to store water in times of shortage. Some of these farmers built their reservoirs on waterlogged lands and make profit of lost water, but the others steal water in order to feed their reservoirs. Some farmers steal water directly from the dam to irrigate land nearby.

4.3.3. Taking water directly from the main canal

Official canal outlets must respect a timetable. Some farmers made illegal outlets feeding illegally cleared plots, sometimes only by diverting water with a rock, a sand bag or a tile and sometimes by breaking the canal's concrete. Those farmers should be integrated to the scheme, and ultimately to the WUA.

5. Discussions and prospects

5.1. Creation of the Water Users' Associations

The National Water Act states that the main purpose of a Water Users Association (WUA) is local water management. These associations are to be active at a local level and work as co-operative associations for water-related measures. The aims and purposes of a WUA will be different according to its members' needs. For example, in former water boards, the key function of the WUA will be water management: sharing water between members and negotiating overall allocation for the group of users, maintaining the network. In the former homelands, the needs are very different. The small size of the farms and low education level lead to a reduced individual negotiation power as far as commercial contacts are concerned. This will be another function of the WUAs.

The Northern Province chose to encourage the creation of multi-functions WUAs, which will deal with :

- ✓ water management, including domestic water if the irrigation infrastructures are involved in the domestic supply,
- ✓ contacts between farmers and input suppliers as well as service providers, before the creation of a local co-operative,
- ✓ organisation of training sessions for the farmers and planning of the cultivated area at scheme level.

Such associations have been created in the three pilot projects, which combine the functions of financial administrator, maintenance team, service provider and authority in charge of the respect of common rules. The WUA will also be an advisor for the tribal authority and the Department of Agriculture as far as land allocation is concerned.

The WUA will be attached with large powers and will play a central role in the farmers' life. It will look like the reconstructed governmental authority. It will exert control over the activities for which it provides services.

The election system relies on the separation of the farmers in groups, which will be represented in the WUA. This system allows a management of the problems at group level, avoiding too much centralisation, and guarantees a democratic representativity of the farmers. The consultant team will be part of the WUA for three years, and will play a regulation role.

This unique structure seems to offer a sound basis to launch the rehabilitation project. The split into several specialised structures could have led to useless intricacies and lack of communication. However, we would like to voice some reserves about the viability of such an association in the long term. The different functions could have a negative interaction. For example, if the co-operative fails, it could have negative consequences on water management, and control might become ineffective. If the community is divided into conflicting groups, a part of the farmers could be deprived of all kind of service, or even see their land confiscated. The managers could take advantage of their power. A solution would be the creation of another farmers association who could play the role of counter power, for example when the consultant team will withdraw after three years.

5.2. Water costs

Four example for water pricing are discussed below, with regard to the situation:

- *Payment according to available area*: every person who enjoys the use of a plot pays a fixed amount every year. The calculation is easy and this system pushes the ones who do not crop their plot to transfer it to another person (lend, rent). But the farmers who cannot crop the entire plot are disadvantaged (types 8 and 9).
- *Payment according to the cultivated area*: every farmer pays a fee in proportion to his/her cultivated area. The ones who are in a precarious situation and crop only few blocks are given an advantage (types 8 and 9). It regulates the number of plots cultivated. However, the implementation of this system is difficult because the cultivated area has to be registered every year (and controlled to avoid cheating).
- *Payment according to the gross margin*: the fee is calculated according to the area and the profitability of the crop, which allows a social distribution. The system needs a detailed registration for every crop and cropped area.
- *Implementation of a water market*: this system regulates precisely the cultivated area. But the water could be monopolised by the wealthiest farmers.

5.3. Promote economical ways of farming

LVA propositions concerning the way of farming on the scheme promotes increasing quantities of chemical inputs, in order to near the yields of the white areas. These propositions would allow increasing the gross margin and integrating the water bills to the farmers' budget. But the increase of monetary expenditures make them out of reach of the poorer ones, including types 8 and 9, but also 6 and 7. In our opinion, it would be positive to promote also economical ways of farming. Furthermore, this could increase the organic matter rate by developing a multi-functional livestock farming.

An increased number of cattle would have many advantages :

- It could be used for ploughing, but also for planting and weeding. It would be a saving of both time and money. Animal draught techniques are still present in the area, which would facilitate the development of these practices. Moreover, the soils are light, and can easily be ploughed by animals.

- The cow dung spread on the fields would increase the organic matter rate in the soil and then its fertility. Cropping fodder plants in winter could even better the process.
- Cattle could produce milk.

Other expenditures have to be examined in terms of reduction.

5.4. Improve products' transports and outlets

Today, most farmers face huge difficulties in transporting inputs and products. If the creation of a co-operative could reduce these difficulties, measures at a smaller scale could be taken, such as medium-term credits intended for the purchase of a pick-up truck (bakkies).

As far as markets are concerned, the geographical situation of the scheme, between the Kruger Park and the Klein Drakensberg, could be used profitably to develop the corresponding markets (tourism). However, these clients are demanding, concerning quality of the products and delivery time.

6. Conclusion

The existing project has to face several serious obstacles, as many legal matters are still to be discussed and are often ignored by the local stakeholders:

- Land tenure reform is still pending. As a matter of fact, the Land Policy adopted by the Government will influence the fees the farmers will have to pay, as well as the rights they are entitled to and the financial credits they will get. Many points remain unsolved, for instance, are farmers allowed to sell or lend their land? Elements of the procedure for accessing land in the scheme (permission to occupy –PTO-) are described in annex, according to what has been observed and expressed by local stakeholders. However, certain aspects remain unclear, at least for local stakeholders, *i.e.* land transmission process from head to relatives, right to lend or hire land under PTO, prospects on non-cultivated land?...).
- Withdrawal of the Government has been decided with no clear strategy: since 1985, the Government has strongly cut credits without granting the farmers any kind of compensation, many irrigation schemes in the Northern Province survive with no assistance.
- Local Government was supposed to support the Users Association. It is not yet ready to do so because of the forthcoming local elections in December 2000. Moreover the difficult relationships between tribal authorities and local elected representatives could possibly prevent the Users Association from making correct decisions.

The scheme is threatened by the lack of both discipline and organisation. The development of the Users Association will face with many difficulties, for instance, it will have to tackle the undisciplined and individualistic behaviour of farmers, especially in Dingleydale. Furthermore, because people are not used to voting and defending their rights, the representativity of the association could be in danger.

Farms are currently not very productive and face difficulties in integrating markets and in paying water bills. Some farmers have problems meeting their expenditures since the removal of governmental help. These farmers will never be able to comply with the National Water Act, which plans to make them pay for water to cover the running costs of the scheme. Moreover, the agricultural margin suffers from limited outlets.

However, there may be enough positive aspects to enable the ITM project to be successful.

The climate is good, and despite the worsening quality of the soil, the agricultural potential is high : commercial farms in the neighbouring areas displays good results.

Within the scheme, some farmers outperform others, since they are ready to crop a larger area and to take advantage of a developing market. These farmers could become the core of the project and of the association.

The LVA team will remain on the scheme for three years, which guarantees an ideal launch of the association, and will ensure a good representativity of farmers in the association and will facilitate the negotiation with suppliers and potential buyers.

This study looked at three different levels : the local level (study of the surrounding villages), the regional level, and the national level (study of the institutions). The apartheid policy had consequences on these three levels :

- white and black populations have been separated,
- the agricultural activities were also separated by the creation of villages for crop farmers or for livestock farmers,
- the area has been separated in three land use patterns: the residential area, the arable land, the grazing land.

The last two points result from Betterment Planning, which was carried out in the sixties and has led to many dramatic effects:

- Fertility in the scheme has strongly been damaged because of the split between crop and livestock farming systems, but also because of the long distance between homesteads and fields. In the non-irrigated lands, the consequences are the same.
- Soil has been eroded and canals deteriorated due to the large animal and human density.
- Huge inequalities have occurred between people in the scheme and the surrounding villages which have never received help and consequently have a much more precarious existence. Moreover, because the Governement helped them, farmers in the scheme tend to become passive, not familiar with decision-making.

It seems important to question the ITM project, which is once more limited to the scheme and to water resource management, without taking into enough consideration the interactions with the rest of the area and other natural resources, like wood for example. The State withdrawal must be accompanied by an overall reflection on the entire agrarian system.

Finally, with regard to the current situation and process, three scenarios can be considered for the future. They aim at creating awareness and stimulating reflection and proper decisions:

Contrasted scenario: Towards a commercial scheme	Land is monopolised by a small number of farms who adopt commercial practices. They form the core of the WUA. Few small-scale subsistence farmers remain.
Positive scenario: Mix of commercial and small-scale developing farming	Some farms become larger and get commercial, but a large number of small-scale farmers remain on the scheme. The WUA represents this diversity and operates properly.
Negative scenario: Collapsing, abandonment of the scheme	The WUA fails, due to lack of interest by subsistence farmers and non farming land-right owners. Infrastructures deteriorate again, until the complete stop of irrigation.

ANNEXES

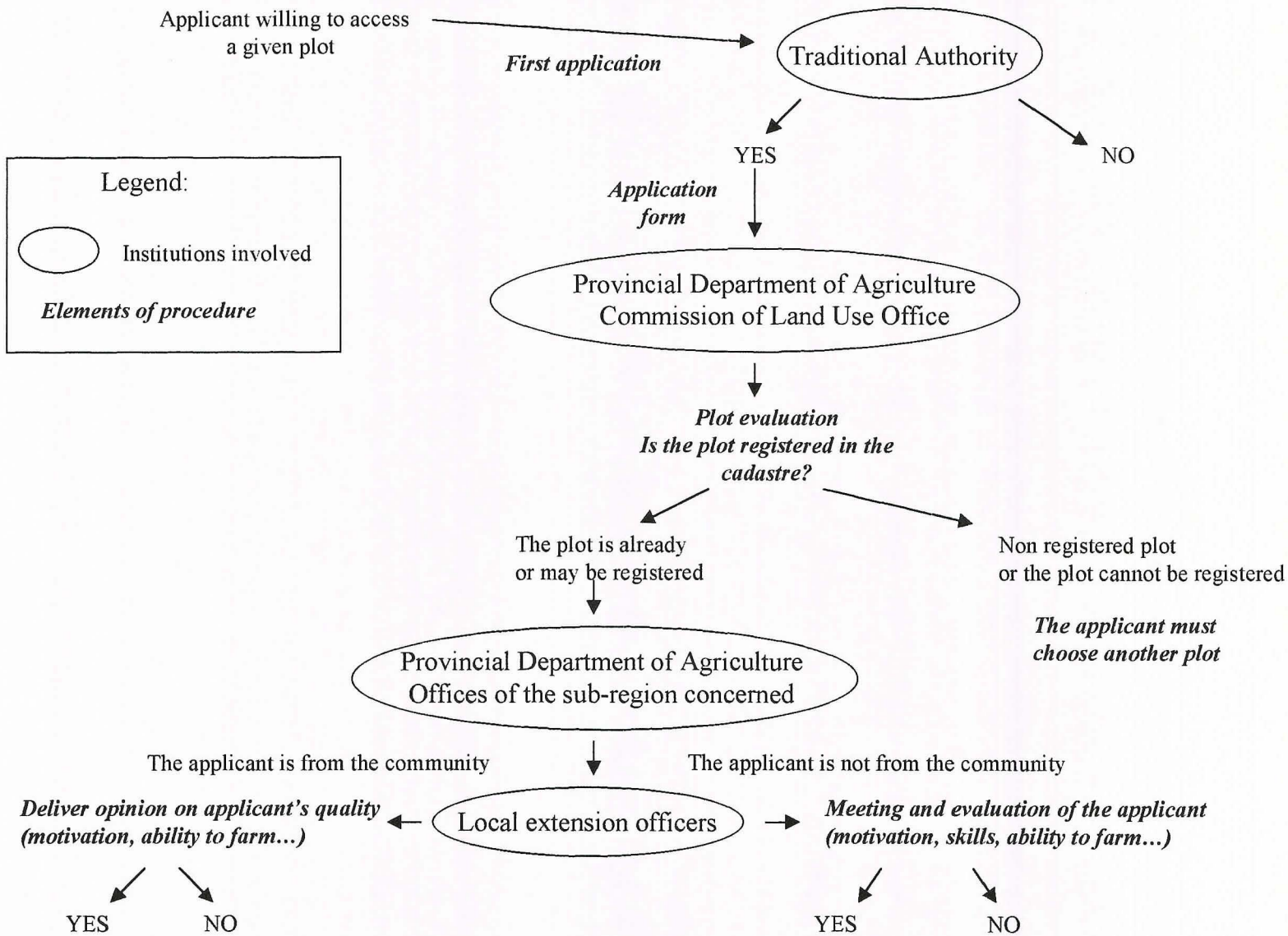
Outline of the original report :

Résumé

Cette étude a été réalisée en Afrique du Sud, dans un périmètre irrigué de la Province du Nord, dans une des anciennes zones noires (homelands). Le périmètre, situé dans une zone sub-tropicale semi-aride, a été construit par le gouvernement d'apartheid pour fournir emplois et moyens de subsistance aux populations locales. Les exploitations, avec des superficies de 1 à 10 ha, cultivent du maïs en été et des légumes en hiver. Dans le cadre du désengagement de l'Etat sud-africain, ce périmètre gouvernemental va être transféré aux agriculteurs préalablement regroupés en Associations d'Usagers de l'Eau. L'étude a été conduite en collaboration avec l'équipe de consultants chargés par la Province du Nord de la mise en place du transfert.

L'évolution du système agraire au cours du 20ème siècle montre une dégradation de la fertilité due à la dissociation de l'agriculture et de l'élevage et à l'éloignement des parcelles. La diversité des exploitations a été représentée grâce à une typologie qui met en lumière des catégories fragiles d'exploitants que le transfert pourrait rendre encore plus précaires, tandis que des exploitations performantes et dynamiques pourraient s'agrandir et intégrer des circuits commerciaux. La distribution de l'eau, dont les mécanismes ont été présentés sous forme de modèles d'action, s'est révélée très désorganisée, et pourrait constituer un obstacle au bon fonctionnement futur. Enfin, l'étude des villages jouxtant le périmètre met à jour le fossé qui sépare le périmètre subventionné et encadré des zones d'élevage et de résidence sans aucun soutien.

Elements of the procedure for accessing land in the scheme (permission to occupy –PTO-), according to what has been observed and expressed by local stakeholders



Location and schematic map of the studied schemes