

The Practice of Smallholder Irrigation

Case Studies from Zimbabwe



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Contents

Acknowledgements	v
Notes on contributors	vi
Introduction	viii
1 Continuity and controversy in smallholder irrigation <i>Emmanuel Manzungu and Pieter van der Zaag</i>	1
2 Challenges of independence; Managing technical and social worlds in a farmer-managed irrigation scheme <i>Nyasha Matsika</i>	29
3 Contradictions in standardization; The case of block irrigation in smallholder schemes in Zimbabwe <i>Emmanuel Manzungu</i>	47
4 Wielding water in unwilling works; Negotiated management of water scarcity in Nyanyadzi irrigation scheme, winter 1995 <i>Alex Bolding</i>	69
5 Whose water? Interlocking relations and struggles over water in Nyamaropa irrigation scheme <i>Dumisani Magadlela</i>	102
6 Who feeds the children? Gender ideology and the practice of plot allocation in an irrigation scheme <i>Carin Vijfhuizen</i>	

4

Wielding water in unwilling works

Negotiated management of water scarcity in Nyanyadzi irrigation scheme, winter 1995

Alex Bolding¹

This chapter analyzes how a state agency, Agritex, tries to cope with water scarcity in a smallholder irrigation scheme that is complex and difficult to manage, and that has been marred by scarcities since its outset. It does so by looking at the practices of the people involved in the management of the Nyanyadzi irrigation scheme during the winter season of 1995.

Irrigation management entails the control of infrastructure, managers and the local population, which together results in some kind of control of the movements of water (cf. Bolding *et al.*, 1995). However, different infrastructural 'improvements', that were implemented in Nyanyadzi scheme over the years with a view to increasing the scheme's water supply, have actually increased the complexity of controlling water flows through gates and canals.

A government-imposed (farmer) Irrigation Management Committee (IMC) has replaced the former farmer representative body that was known as the 'Kraalhead Committee', and finds itself in the middle ground of a complex field of government departments and their staff, and the various groups of irrigators trying to manage the scheme. The sheer number of people involved in management, as well as the imposed character of the IMC, have certainly not made things easier in controlling the operation of the scheme.

Finally, another complicating factor is that the local population comprises people of different and multiple backgrounds: dryland farmers, irrigators, businessmen, traditional leaders and politicians, to mention but a few. They have aligned themselves in numerous factions organized along dynamic political, social and professional lines. The Nyanyadzi community in particular has a legacy of political resistance to government interference. As early as the mid 1960s, farmers who followed

government extension advice were intimidated and suffered physical or material damage (Reynolds, 1969: 12). In 1979, the scheme was closed for reasons of sabotage by local irrigators.³ Since independence government initiatives have met with resistance from different political corners, assigning the Nyanyadzi community unpopular connotations such as 'difficult' and 'troublesome' within government circles. All of these factors have resulted in a complex and difficult to manage situation which calls for a sophisticated calibration of the technical, managerial and socio-political aspects of water control.

The following section describes some infrastructural and organizational aspects of Nyanyadzi irrigation management and briefly discusses the tools present-day managers have to tackle the complexities of the scheme. Realizing that a scarcity of water was bound to emerge, the scheme's management tried to implement a number of water control measures during the 1995 winter season. By closely following, month by month, the implementation of these measures, the dynamics of water management will be revealed in the subsequent sections of the chapter.

The author has also been an actor in the management activities of the past season, by attending meetings, chatting in offices, interviewing people both inside and outside the scheme, taking measurements of water flows and giving suggestions on how to solve emergent issues whenever asked to do so. I worked with two assistants, one of whom was the son of the irrigation manager (taking measurements). My active participation was part of the deal with local people that allowed me to do research. It enabled me to get a more profound understanding of what is known to be one of the most 'difficult' and complex smallholder schemes in the country. To focus my attention I have collected most of my data from one irrigated block.⁴ block B (see Table 4.1).

Table 4.1: Nyanyadzi blocks, command area, registered plottolders and water source

Block	Command area (ha)	Plottolders (no.)	Water source
A	136	125	Odzi and Nyanyadzi
B	147	193	Odzi and Nyanyadzi
C	65	67	Nyanyadzi
D	69	75	Odzi and Nyanyadzi
Total	414	460	

Source: Map in Agritex Nyanyadzi office, 1995.

The chapter shows that the actors who claim to be in the driving seat of water control are actually not on top of the situation. Occasionally people might refer to legal frameworks and management responsibilities in an effort to legitimize their presence and actions. They do so most outspokenly, in the form of speeches, during meetings where water issues are at stake. These speeches are informed by the past and the present and try to bridge incongruencies that occur in day-to-day management. However, they also conceal a number of 'realities' in the scheme that affect the implementation of water control. Pertinent 'realities' during the 1995 winter season in Nyanyadzi were the number and kind of plottolders, a faulty pump station, the actual size of the scheme and a farmer organization that is not in charge nor fully recognised by the irrigators. These 'realities', in the end, impeded the implementation of water scarcity control measures. Depressed yields of the bean crop coupled with a total crop failure for wheat marked the end of the season. By analysing the actual negotiations that took place between the key actors, this chapter tries to shed light on some of the root causes of the reported low performance of smallholder irrigation schemes in Zimbabwe. The crisis situation during winter 1995 allows some important conclusions to be drawn with regard to the dependency of the scheme on its wider context (for example, hydrology, administrative bureaucracy); the technical infrastructure that obstructs the emergence of adequate arrangements (for example, a pump house that no local actor masters); and the fact that all farmers and officials have to agree how to proceed in a scarcity situation. Given so many adverse factors, it is amazing what the Nyanyadzi canals, management and community managed to achieve in irrigation performance terms. The chapter ends with a discussion of future options in Nyanyadzi water management.

IRRIGATION MANAGEMENT

Nyanyadzi infrastructure and history

In 1934, a famine year, an American missionary called Alvord, started the construction of a canal on the north bank of the Nyanyadzi river (Alvord, n.d.: 38). It is claimed that the canal was dug by labourers from Chipinge district who had failed to pay their hut taxes. Most of the local people were suspicious of the canal and feared it would be another whiteman's ploy to deprive them of something. Thus most of the initial plottolders were outsiders.⁵ The favourite explanation of Agritex staff is that local people feared they would have to work harder in irrigated agriculture than in dry agriculture. The scheme comprised only 29 one acre plots and functioned satisfactorily, until it was washed away by a storm flood in 1942 (Alvord, n.d.: 45). However, on 16 October 1937, another canal was opened up on the southern bank of the Nyanyadzi river irrigating the present block A.⁶ Soon more blocks of irrigable land were opened up: blocks B, C and D (1951) followed successively. In 1949 a night storage dam was constructed (Roder, 1965: 106). By 1960 there were 304 hectares of land under irrigation. Then between 1961 and 1963 the Native Department

allocated yet more plots, amounting to a total irrigable area of 380 hectares.⁷ In 1983, the area was again extended by including illegal plots that had developed over time in blocks A, B and D. The total then was 414 ha. The number of hectares and official plotholders in each block can be found in Table 4.1. However, since 1983 more encroachments have occurred. The present size of the scheme is estimated to be between 430 and 450 hectares.

As can be seen on the map of Nyanyadzi there are two sources of water that supply the scheme (Figure 4.1); the Nyanyadzi river water, which can be used on every block and the water from the Odzi river which can only reach blocks A, B and D. The Odzi water is nowadays released from the Osborne dam, located 120 km north of the scheme, and pumped into the scheme through the 'new' pump house. After travelling through a piped line it spills into a distribution box from where it can flow into the scheme or proceeds to the night storage dam. The original canal, tapping from the Nyanyadzi river by means of a concrete weir, is unlined and feeds into the night storage dam after serving block C. Most of the canal network has been lined, except for one secondary canal in block BN (northern half of block B) and the canal tapping from the night storage dam as far as the main road.

Water can reach blocks A, B and D via different routes. This is a result of the many infrastructural 'improvements' that have been applied over the years that have added to the complexity of the scheme. Secondary canals can be operated with ordinary sluice gates, some with thread rod, others with holed rods. The actual water dynamics are quite difficult to understand once the water is flowing. Most gates however are operated on an on/off basis. The scheme is littered with remnants of measurement structures. These were installed in the 1980s, when a British consultancy firm performed a water efficiency study (Pearce and Lewis, 1988). The flumes, sharp crested weirs and gauges that went with the study are not used by local management staff to monitor water flows. Irrigation from tertiary canals takes place by means of siphons. The fields are generally nicely levelled and divided into border strips. A typical 1-acre plot consists of 18 *bunds* or border strips. Most tertiary and secondary canals were lined in 1983–84 and have a trapezoidal shape. Because of a lack of off-take structures (concrete boxes) supportive canal banks are normally in a bad shape as a result of underflow caused by siphons spilling the water onto naked soil.

The Nyanyadzi irrigation scheme is characterised by a number of water-related problems. The main and everlasting problem of the scheme has been water shortage (see Table 4.2). The supply has never been fully able to cope with the continuous expansion of the scheme and the resulting increases in water demand. From 1950 onwards reports of insufficient flow in early summer months abound. In 1957, the 'old' pump house was constructed to augment the dwindling Nyanyadzi supply by using Odzi water. Plans to augment the scheme's supply in drastic ways have been produced since the 1960s. From 1968 to 1974 there were ill-fated attempts to construct a dam on the Nyanyadzi river. Despite the surveying of four suitable sites on the

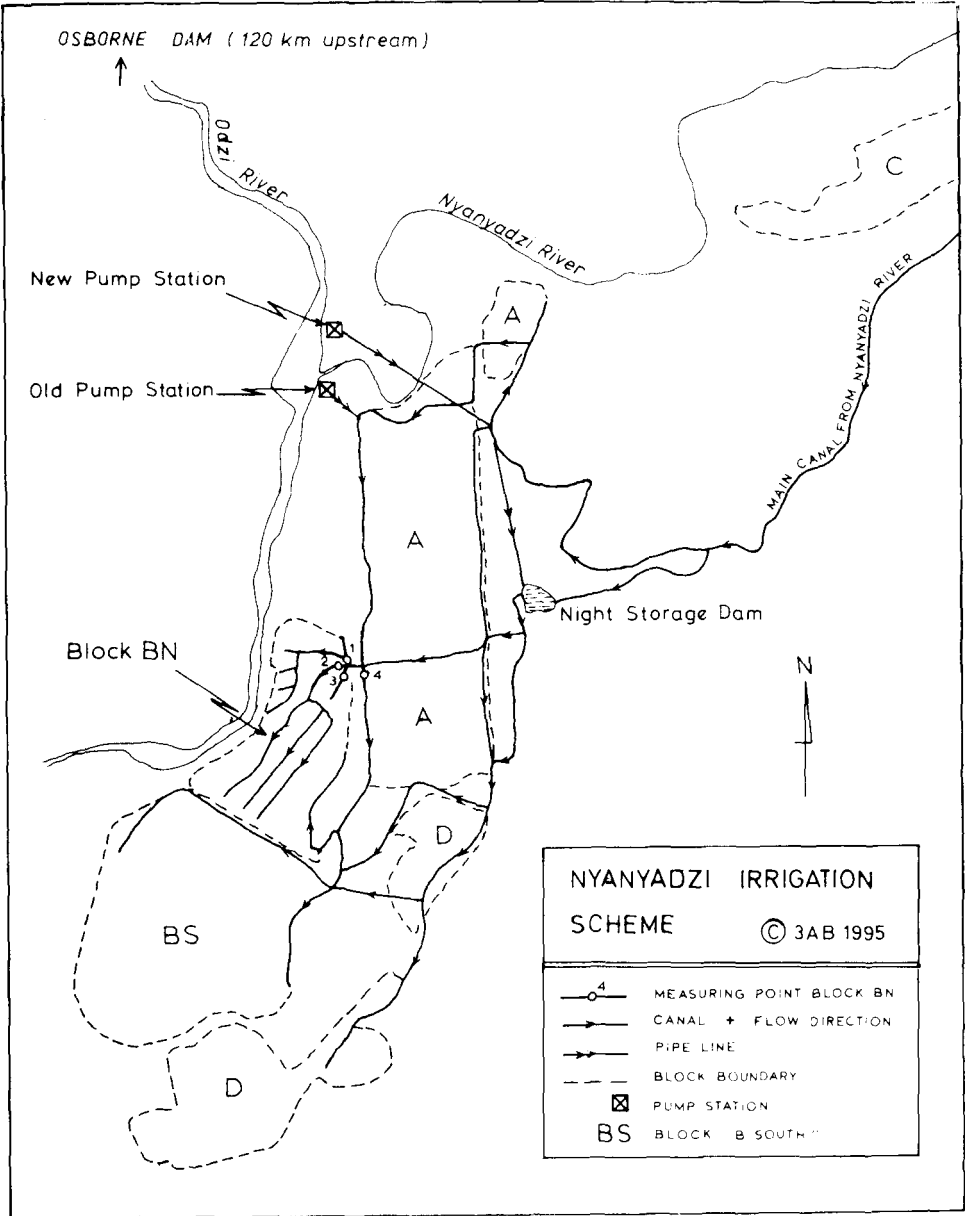


Figure 4.1: Map of the Nyanyadzi irrigation scheme

river and actual production of a design, the costs involved were considered to be too high.⁸ The Nyanyadzi river has proved to be increasingly unreliable as a water source, due to irrigation developments upstream and a drastic increase in land use since independence (Bolding, 1996).⁹ In three of the five first years of the 1990s, the river has actually dried up before or during the winter season, giving block C farmers no winter crop to reap. Furthermore, increasing levels of land degradation in the upper catchment have resulted in siltation problems at the weir and main canal. This puts a heavy burden on the scheme's maintenance demands.

With a continuous water shortage as the most persistent feature of the scheme, it is interesting to study which water scarcity measures have been developed over time by the managers of the scheme. But first we will have a look at the present management 'structure'.

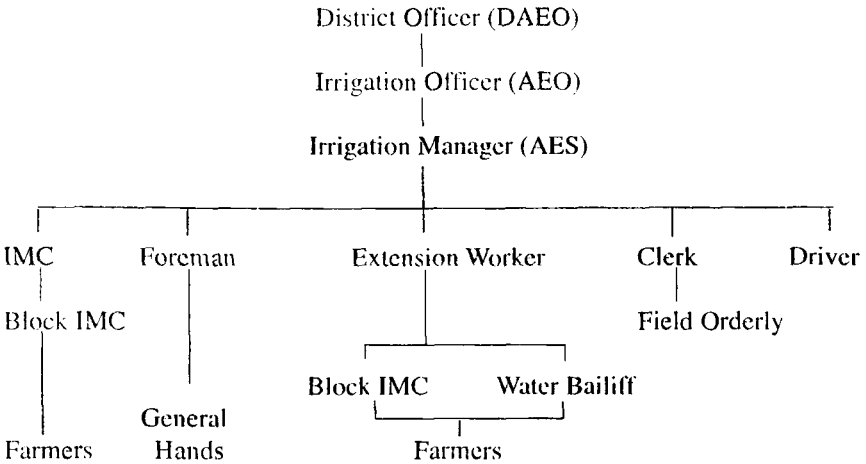
Table 4.2: Years of water shortage at Nyanyadzi

Decade	Years of water shortage	Years Nyanyadzi river was dry
1940–1949	1947, 1949	
1950–1959	1952, 1954, 1957	
1960–1969	1960, 1961, 1964, 1968	
1970–1979	1970, 1971, 1973	
1980–1989	1983, 1984, 1987	
1990–1995	1991, 1992, 1994, 1995	1992, 1994, 1995

Source: Roder, 1965: 146; Hydrological records (E119) from Department of Water Development; Rainfall data: Meteorology department.

Management structure in Agritex irrigation schemes

The official management structure in Agritex irrigation schemes was discussed during a 5-day workshop for all supervisors and extension workers in irrigation schemes in Manicaland, held in Manesa, Chipinge, in September 1995. The participants came up with the following organisational chart. Note that the titles of some staff working in irrigation differ from their formal position in the Agritex hierarchy: the irrigation manager is formally ranked as Agricultural Extension Supervisor (AES); and the irrigation officer as Agricultural Extension Officer (AEO).



As can be seen, Agritex features prominently in the chart, even to the extent that the role of the Department of Water Development (in the person of the pump operator) is left out. Also revealing is that the Irrigation Management Committee (IMC) is placed under the command of the extension supervisor, otherwise known as the irrigation manager.¹⁰ According to a policy document of 1983 (Derude), the IMC's main responsibilities are: to discipline irrigators in the scheme; control the water; collect funds (maintenance fees) and penalties; and draft by-laws for smooth operation of the scheme. One participant remarked that there were sometimes clashes between kraalheads and the IMC over control of the scheme. This was a clear reference to the fact that in some schemes, notably Nyanyadzi, there was a farmer committee working with the scheme's management before independence.¹¹ The workshop discussions did not focus on how to resolve conflicts or how communication was to ensue. It was apparently assumed that communication goes along the lines of command and is basically a matter of implementation of whatever is decided by the top most scheme manager, the irrigation officer. The issue of handing over the management of the scheme to IMC's, as prospected in the policy document, was discarded on the grounds that most schemes failed to even pay their annual maintenance fees.

PROLOGUE TO THE 1995 WINTER SEASON

Before we turn to the actual flow of events in the 1995 winter season, some of the management realities that informed the behaviour of the prime actors in the Nyanyadzi irrigation scheme are discussed. The section shows some of the dynamics of management in Nyanyadzi that have been rubber-stamped as a conflict of roles between Agritex, IMC, Department of Water Development and farmers.

March 1994: By whom and why was the water supply cut?

The Department of Water Development has a local office in Nyanyadzi. One officer heads the office and has seven workers at his disposal. Two of them function as pump operators for the Odzi pump station. The Department of Water Development is responsible for operating and maintaining this pump station. It brings the water up to the night storage dam, below which water management becomes the responsibility of Agritex. Officially, the local water officer has to supply labour to de-scoop the pump house whenever it is filled with sand deposits from the Odzi river. However, because of a chronic lack of staff, a deal has been struck with Agritex. The local Agritex office provides the labour to de-scoop the pump sump by hand. In January 1994, the pump house was full of silt. The pumps had to be stopped and this time both Agritex and the Department of Water Development provided labour for the de-scooping. From 24 January to 4 February the Odzi river was in flood. The pumps had to be stopped again because of siltation. On 4 February, Agritex general hands started working on the plant. However, before they had finished the job they were transferred by the local irrigation officer to work on the main canal from the Nyanyadzi river. This canal had also silted up. Meanwhile the scheme remained without water. The maize crop was in desperate need of water. Pressures started building up and finally dissipated during a general meeting on 11 March 1994.

The theme of the meeting was: by whom and why was the water supply cut? After the opening remarks by the chairman of the IMC, the district officer explained that:

Agritex' responsibility on water starts when the Department of Water Development has pumped it independently into the night storage dam. . . . Agritex can give a hand to the Department of Water Development (when the need arises) by supplementing labour. . . . Before the irrigation officer transferred labour from the pump house he had received assurance from Department of Water Development officials that they would replace such labour with casual labourers. . . . Agritex is responsible only for canal water and that is why an instruction was given to have the Agritex labour force go and work on the canal from the Nyanyadzi river rather than maintain pump houses.¹²

This remark triggered a flood of accusations. Kraalhead Dirikwe complained bitterly that "Agritex acted without the farmers concern". Canal cleaning was a responsibility of the farmers. "Therefore Agritex labourers could have continued working on the pump house instead. Why did the concerned irrigation officer work to this detrimental effect?" A prominent local farmer and former IMC member complained that "the farmer committee (IMC) did not act as expected" to avert crop failure. The chairman of the IMC, however, responded that they did not have full control over the Agritex labour force. The district officer concluded by apologizing

for not consulting the IMC on the matter, but still expressed his surprise that neither the farmers, nor the Department of Water Development, nor local Agritex staff, had come up with a solution to the problem.¹³ Another prominent businessman and former IMC member then reprimanded the district officer for not assuring himself of the labour replacement before moving the available labour force. His older brother called for unification of Agritex and the Department of Water Development and the weeding out of delaying protocol. A member of the IMC wondered why Agritex officials "appeared to have a low interest in doing something about that outstanding problem", when the IMC presented them with a farmer petition. He further requested Agritex to take full control of the water problem and supply method.

The district administrator, who had been called in as an arbitrator, observed that there was a 'role conflict' and communication breakdown between the Department of Water Development, Agritex and the IMC. He requested more frequent dialogue between IMC and local Agritex staff. He proposed one line of communication: Department of Water Development-Agritex-IMC-Sub committees-grassroots farmer. Furthermore, he expressed the need for utilization of local leadership, that is, councillor and local businessmen, in resolving labour conflicts through food for work program.

In the end, a number of solutions were suggested. Officers should be more responsive to farmers' needs. Agritex should always be informed first when water was not being pumped. The IMC should call emergency meetings, and information movement must be two-way. Agritex should make sure that the Department of Water Development delivers the water. Local people must rely on themselves to remove silt when the need arises. The councillor, local businessmen and IMC should be involved and monitor the process.¹⁴

This meeting clearly showed that the responsibilities of each party are open for renegotiation in case of an apparent breakdown in the line of command. The meeting reveals that irrigation management is a lot more dynamic than an organisational chart can tell. For the local irrigation officer, the meeting had another effect: from now on, he promised himself to k

attitude of the Nyanvadzi irrigators obstruct my work. I am only sitting back now. I recently found out that Nyanvadzi is one of the most problematic schemes in the country. It is the attitude of the local irrigators. These people are always expanding the area. As an officer you try to do well for your people, but if it is not appreciated, well . . . I am tired of doing all these things for their development . . . Just keep quiet and inform your bosses about your position, so they can't complain about your work. I noticed that the irrigation officer for Nyanvadzi in the past always organised a transfer

after say 6 months in the post. That is because after 6 months you start to get irritated. It becomes unbearable . . .¹⁵

January 1995: enforcing a by-law

On 26 January, 1995, there was commotion in the local Agritex office. The irrigation manager explained to me that there was trouble with a certain block B irrigator. "He wants to run his own IMC. He wants to take water whenever he wishes to". He was fined \$50 for stealing water, conforming to the IMC by-laws. Then he harassed the chairman of the IMC and beat up a member of the block committee. The block B extension worker decided to organise a meeting.

The meeting was held under the big tree in block BS (the southern half of block B). Fifty-eight people attended. The extension worker mentioned in his opening speech, no doubt with the intention of letting his audience know what a splendid job they were doing and how they should be grateful, that Nyanyadzi was different from many other places:

Government is building canals here, whereas in other places there are no crops like these. There are duties to get water for *maekes* [sic] (the acres, i.e. the irrigation plots). One canal is not enough to supply other people at the same time. You would have to work from 6 o'clock in the morning and plough two or three times a year if you yourselves had to compensate for the money put into the canal.¹⁶

Then the irrigation manager took over and supported him, saying that his officers were not just sitting around offices all day. They taught the people. He advised the farmers gathered to start preparing for the bean season. The IMC chairman then gave a dramatic twist to the meeting:

The IMC is supposed to work together with the officers. But now there are too many problems with people in canals 7 and 8. I resign. Your problems will have to be directed to the *mudhomeni* (extension worker) from now on.¹⁷

However, the extension worker quickly established that he would not allow the chairman to resign from the problem at hand. He argued that the IMC was supposed to work with the people, and that Agritex was there to teach and assist people in irrigation. But, "What can we do with people who open the gate just like that?" The floor grumbled: "Spell out your point!" Finally, the local extension worker got to the point and explained what had happened. The IMC chairman in turn then indicated that he had been threatened by relatives of the culprit. The culprit himself then stood up and said that as he did not want a public row, he would come to the office to settle the issue. However, the irrigation manager replied that he did not want to receive the

person in his office before the issue was solved. The irrigation officer backed the chairman by stating that this problem had grown over his head. It should be solved in the office or dealt with by the police. But for now there should be instant justice. One water bailiff said that he went to collect the fine but was chased away. The culprit was forced to step forward and explain why he failed to pay the fine: "The water was for germinating seeds. I was given the water by the bailiff, but someone else took it." This version of the story was widely disputed: he stole the water! One farmer told him to pay up: "People do not hate you. If you pay up, we go on." Irrigation officer: "*Pasi nenyope* [sic] (down with lazy people). If you are given a fine and you fail to pay: what should be done? . . . We should exactly double the fine. Let us stick to the by-laws." The mother of the culprit then said that she would get the money for the fine.

Later on in the meeting a plowholder indicated that he had trouble in getting his water turn. The IMC chairman looked like a new person when he said that he would come to attend the problem. By this token he re-instated himself as the IMC chairman. The extension worker added that he could also help address the problem. The irrigation officer stressed that if any person of the IMC, or any of the bailiffs were to be threatened by irrigators, Agritex would call in the police.

What is demonstrated by the meeting is the delicate position that the IMC holds. The IMC chairman in his speech emphasized that he is supposed to work with the Agritex officers. In this case he was threatened with violence so he needed back-up from the local Agritex office. Faced with an impossible situation he decided to resign. However, when instant justice was done and the people had backed the decision to have the culprit pay up twice the fine, he felt confident enough to re-install himself.

Agritex staff, on the other hand, are keen to emphasize that government is doing a tremendous job by helping these people with irrigation infrastructure. In return they should work hard and cooperate. Agritex' role is to provide technical advice. However the IMC, the farmers' committee, is there to work with the people and solve any water problems. There should be no need for Agritex to come out of their offices, except for giving crop advice. Should the IMC be unable to cope with the problem, a meeting in the office could be organised, where Agritex could function as a kind of arbitrator. However, in the first instance Agritex would not interfere.

These events were still in the back of the mind of most people involved in the Nyanyadzi irrigation scheme at the start of the new winter season.

MARCH 1995: THE ONSET OF A 'DRY' WINTER SEASON

In March 1995, it became clear to the people of Zimbabwe that the much hoped for rainy season of plenty had not come. The country plunged into another very dry winter season. By March 16, the Nyanyadzi river had already completely dried up. The situation in the Government dams was not much better. Osborne dam was only

7.5 per cent full by the end of February. The provincial water engineer in Mutare had not yet decided what to do with the little available water: how to distribute it amongst the many smallholder irrigation schemes in the Save valley? However, sometime in March, the provincial water engineer decided to allocate the little available water for the winter season to the Nyanyadzi irrigation scheme and communicated his decision to the irrigation specialist at the provincial Agritex office. The local Agritex office, however, remained unaware of this decision during the remainder of the season. Most farmers in Nyanyadzi, in the meantime, were still irrigating their maize crop for the final time. The Odzi pumps were regularly down because there was no water in the river (see Figure 4.2). This instilled an awareness amongst the Nyanyadzi people concerning the feeble water situation.

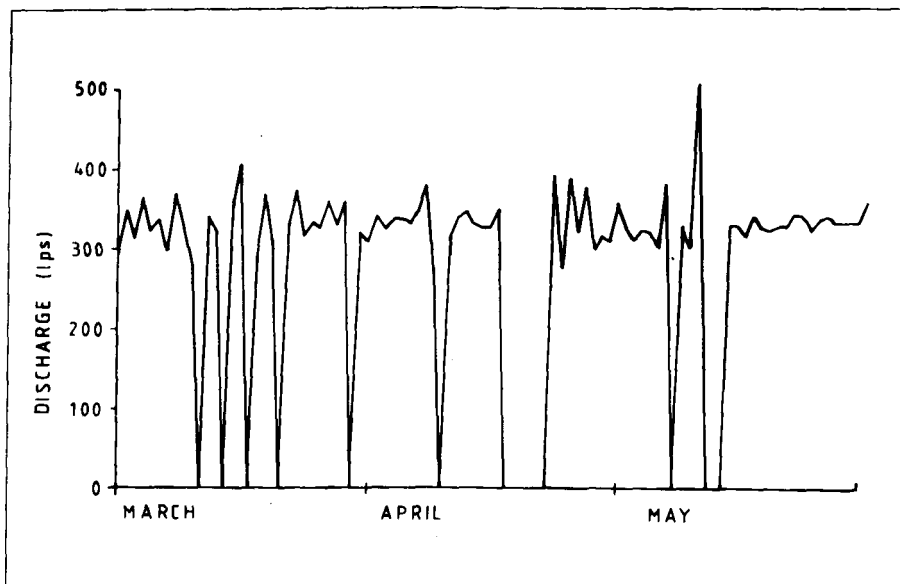


Figure 4.2: Discharge from Odzi pump station, March–May 1995

The bean contract

The IMC had entered a contract, on behalf of the Nyanyadzi irrigators, with a small firm called Agricultural Seeds Limited, for growing 250 hectares of beans in the coming winter season. A list had been prepared of all farmers who intended to grow beans. The contract raised the hopes of most irrigators. The annual bean crop is normally the cash earner for covering school fees and other big financial expenses. The negotiated price of Z\$5 per kg of beans was the same as last year's price. However, Block C irrigators had not been included in the deal. Their winter season was already over: no water.

The one-acre rule

The irrigation manager decided to cut down the irrigable acreage, in anticipation of a lack of water from the Odzi. In a meeting with all water bailiffs and the IMC it was decided to allow each plotholder one irrigated acre only. This would spread the scarcity equitably over all plotholders. The measure became known as the 'one-acre rule'. It was to be communicated and implemented by the water bailiffs in conjunction with the IMC.

The pumps

During an Agritex/IMC meeting on March 30, the situation at the pump house was discussed. The irrigation manager presented his view to the meeting on the problems with the pump house. The pumps used to run for 24 hours, but were now failing to do so. On consultation, the local water department representative, told the farmers that pumps were breaking down too frequently to allow pumping for 24 hours. Furthermore, there were problems with drawing sufficient water from the river to the pump house. He went on to indicate that Agritex did not have sufficient general hands any more to work on the pumps and cooperation from the farmers was requested. "Agritex and the Department of Water Development provide you with a service, but the pumps break down all the time". The IMC chairman requested help from Agritex. In his opinion, they were the ones who had to solve the issue of the pumps. One of the extension workers pointed out that Agritex was not able to communicate directly with the Department of Water Development. They had to follow the proper channels, which went all the way up to the chief agricultural extension officer in Mutare, and then from the provincial water engineer down the line of command within the water department. Besides, the pumps were not the responsibility of Agritex and so they were not to be blamed. Another extension worker urged the IMC to take action and visit the Department of Water Development in Mutare. They could easily do so.

The Department of Water Development has always been troublesome, also in the time of the diesel engines (the old pump house). We have met and met over and over again. In March 1994 they promised to solve the issue, but up till now they have done nothing.

In the end the IMC agreed to pay a visit to Mutare.

It is noteworthy that Agritex tries to use the IMC to lodge a complaint with the Department of Water Development on the operation of the pumps. Is this another example of how the IMC is used as the long arm of Agritex? Or is it simply part of a pragmatic strategy: What else can Agritex do to get quick feedback on the pump problems? Clearly, Agritex and the irrigators share a common goal on the issue of the pumps. Both are aware of communication problems as demonstrated by earlier breakdowns. The sending of the IMC can be interpreted as a strategy to circumvent bureaucratic control.

The new water rotation schedule

During that same meeting another cunning plan of the irrigation manager was launched.¹⁸ As a water-saving measure it was suggested that water be pumped straight into the canal network instead of storing water first in the night storage dam. This implied that people would irrigate as long as the pumps were working. In the old system irrigation took place only from 6 am till about 1 pm when the night storage dam would be empty. Pumping would then proceed to fill the dam. "Furthermore, we will have to direct water to one block at a time". It was proposed to have a one-week trial to see whether it would give more water. One extension worker was convinced that the system would prove a success. The extension worker for the remote block B had some doubts:

When we take water straight from the pumps it will be less at one time and thus the water will not reach the outer corners of the blocks, because the pressure from the water level in the night storage dam is not there any more.

He feared that the canal in block BS would not be full enough to irrigate three secondaries at the same time. Another fear was that if water was supplied to block D for one week and the next week there was a pump breakdown, block BS would be deprived. It was proposed to have 3 days per block. But not all blocks were the same size. The first extension worker wondered how many outlets there were in each block. Since this was not known it was decided to give each block 2 days and just give it a try. The block D extension agent proposed to count the number of planted acres. But this suggestion was overruled. The irrigation manager displayed his conviction that it would work out nicely and started jotting the dates and block to be irrigated, as from April 1 onwards. The final schedule arrived at was 2 days each for blocks BS, BN, D and A and no irrigation on Sunday..

Water scarcity in March 1968

To enable comparison and give an idea of water scarcity measures taken in earlier times, a report of a special emergency meeting in the District Commissioner's (DC) office on 6 March 1968, is given below. Attending were the DC, the irrigation manager, extension officer and supervisor of Conex,¹⁹ a representative of water development and someone from Rhodesia Seeds Limited. This all-white ensemble observed that water from the Odzi pumps could be relied on for the winter crop only since (the Nyanyadzi river would soon dry up). With a pump capacity of ca. 113 lps this would give about 28 lps for block A and 28 lps for block B, enough for some 30 ha in block A and 58 ha in block B.²⁰ It was decided to concentrate the water to two areas within the blocks to avoid unnecessary losses. Plottolders would be given the option to grow either cash or food crops. In the case of cash crops under contracts with Rhodesia Seeds Limited, rigid conditions would be relaxed. After the meeting,

the attendants went on an inspection tour through the scheme and discussed the proposals with the 'Kraalheads' Committee' in a separate meeting. The kraalheads requested time to discuss the matter with the plotholders and suggested that unfortunate plotholders, that is, those outside the demarcated areas for irrigation should be permitted to cultivate part of the land of fortunate plotholders. Furthermore, they demanded a remittance of water rates for those who were unable to irrigate (a remittance of 50 per cent was agreed upon by the DC). The kraalheads would inform the irrigation manager which people would undertake winter irrigation and what crops they wished to grow.²¹

If a comparison is made between the two meetings a number of observations can be made. First of all, the (water) situation in 1995 was not fundamentally different from the one in 1968. In both cases management was facing a water shortage. They knew beforehand that something had to be done to deal with the anticipated water scarcity. In both cases farmers representatives were consulted. However, in 1968 the crop planning was based on the amount of water that was estimated to be available. In 1995, water scarcity measures were not based on available water supply, but on an acreage cutting measure (the one-acre rule). Furthermore, the proposed water rotation schedule in 1995 was not based on information that was at hand, that is, IMC list of plotholders that intended to grow beans; command areas of separate blocks. It was a trial and error decision. Striking also is that in both meetings the most knowledgeable actors on the subject the water bailiffs were not explicitly consulted. Furthermore, the 1968 meeting cut across administrative boundaries. Department of Water Development, scheme management, seed house and top administrators were all involved in the decision making. The white establishment could apparently easily meet each other. In 1995, that is no longer the case: administrative boundaries cannot be crossed and time-consuming procedures are rife. To facilitate a short cut of the circuit, local Agritex staff send the IMC to Mutare to find out what the Department of Water Development has in mind.

APRIL 1995: THE NEW ROTATION SCHEDULE

In April things got going in the scheme. Most people had harvested their maize crop and were planting beans and tomatoes. Most of the irrigators planted their beans before May, as recommended by Agritex. With the seed readily available from March onwards, the determining factor for planting beans was water. People planted 3–4 days after acquiring the first water turn.

Pumps

By the end of March, Agritex deployed a grader to re-construct the feeder dam to the pump house in the Odzi river. Since the feeder dam was now repaired, the pump operator no longer needed to wait in the mornings for the Agritex general hands to come and repair breaches. He could start the engines straight away. However, from

17–24 April the pumps were down again: no water in the Odzi river. The IMC, at the instigation of Agritex, visited the district administrator (DA) in Chimanmani on 23 April to enlighten him of the water scarcity in Nyanyadzi and ask him for assistance. The DA straightaway phoned the provincial water engineer, who stated that there was nothing to worry about: the little water that was left in the Osborne dam was earmarked for Nyanyadzi. The problem of pump breakdowns could not be solved in the short term. But at that moment one pump was still working. The IMC reported on their visit to the irrigators during a meeting on 17 May.

Evaluation of the new water-rotation schedule

The main question in the minds of management was whether the new water-rotation schedule had improved the water situation in the blocks. The initial reactions were very positive. Water bailiffs reported more acres were irrigated in 1 day than with the old system. First of all the proposed rotation of 2 days to each block was changed on the instigation of the water bailiffs to give block BS and A one extra day. Canals did not overflow or suffer from low water pressure and the IMC was enthusiastic. It was then decided, on the basis of this little information, to proceed with the new system.

Now, were these claims valid? To evaluate this I will present the data for blocks BS and BN. The comparison will focus on the number of acres that could be irrigated with each of the two systems. In the old system (see Table 4.3) water used to flow into block B during 6 (fixed) days of the week for about 8 hours a day. Based on the bailiff records for Block BN, March 1995, the old system irrigated on average 2.7 acres a day, 13 acres per week. The new water schedules were re-shuffled several times during the 1995 winter season (see Table 4.3). Each of the various rotation schedules that were tried during the season show higher weekly averages, varying from 15 acres in the worst schedule for BN to up to 33 acres in the most favourable schedule. Therefore for block BN the new system was an improvement. In block BS the old system supplied water during 5 fixed days per week, irrigating 4 acres per day, 20 acres per week. Again the six schedules that were tried in the new system show higher weekly averages varying from 26 to 40 acres.

Therefore the new water rotation system brought more water to block B. But how did block B fare compared to the other blocks? To evaluate that, the command areas of the different blocks are compared with the time share each block received in each of the 6 consecutive schedules (Table 4.4). In general, block B fared well, receiving more water than its share in the command area could claim. Still, even in the case where it got less than its equal share of the water (schedules 4 and 5), the irrigated acreage was higher under the new system than under the old one. If the *one-acre* rule had been implemented properly (more of this below), the number of plottolders becomes the right indicator for the acreage under each block (Table 4.5). In that case, block B was not favoured by any of the six rotation schedules, and a convincing conclusion can be drawn that the new system gave more water to each block.

Table 4.5: Number of plottolders compared with time share of water, winter 1995

Block	Plottolders (no.)	share %	rot 1 %	rot 2 %	rot 3 %	rot 4 %	rot 5 %	rot 6 %
A	125	32	30	33	28.5	37.5	30	33
B	193	49	50	45	43	37.5	40	45
D	75	19	20	22	28.5	25	30	22
Total	393	100	100	100	100	100	100	100

Another feature of the new water-rotation schedule was the continuous re-shuffle in the number of days that each block was supposed to receive water. This was a consequence of the on-going negotiations between the irrigators, water bailiffs and Agritex staff. These negotiations took place mostly during meetings (emergency meetings, field days, IMC meetings).

The bailiffs were the prime actors in adjusting the first crude schedule that had been launched after the March 30 meeting. This schedule was a calibration to the actual sizes of the blocks. The subsequent rotation schedules were a reflection of pleas on which block at that particular point in time had received a bad deal. These pleas were made by both extension workers (advocating the block they were responsible for) and groups of plottolders. The rather definite change to grant block BN only 1 day of water was done after a meeting on May 17, when it had been concluded that irrigators in block BN had grossly violated the one-acre rule.

The daily work routine of the bailiffs in the scheme were fundamentally changed by the new system of water rotations. Whereas in the old system every irrigator would know on which day water was earmarked for their plots, the new system and the regular breakdown of the pumps did not warrant any security of water turns. This resulted in the bailiffs being continuously harassed by farmers on when their block would receive water again.

MAY 1995: FAILURE OF THE ONE-ACRE RULE

By May 1995, every plottolder in the scheme was fighting to get his/her acre(s) watered for the first or second time. The pump house was shut down from 8 to 16 May because of repairs to the main outlet valves of Osborne dam. This dry spell triggered another meeting between Agritex staff and the IMC on 17 May.

Who are the plottolders?

The meeting between Agritex and the IMC pivoted around the problems that were signalled with the implementation of the one-acre rule. Several IMC members

indicated that the water bailiffs were tampering with the implementation of the one-acre rule, resulting in some people irrigating 4 acres and others none. The IMC chairman stressed the fact that Agritex should have made a 'follow-up' of the one-acre rule. Without backing from the officials he could do nothing. The extension worker for block A scolded that the IMC did not have the members under control. To underline her analysis she recited a letter she had received from the chairman of the block A committee calling for a general meeting to discuss the lack of communication between farmers, IMC and Agritex. The IMC members were mad about the letter, and insisted that the author had by-passed the existing communication lines. The letter should first have come through the general IMC. They declared the letter should therefore not be considered. The general consensus was that the situation had to be re-dressed. A new water rotation schedule was agreed upon in which block BN would receive only one day of water, instead of two (mainly owing to its small size). It was acknowledged that this measure would probably result in a serious degree of crop loss in block BN, but it was considered of paramount importance to show the IMC's teeth first. The one-acre rule was not a joke.

A discussion ensued on who the actual plotholder was. Agritex stressed it would stick to the official list of plotholders. However, it was observed that some people on that list had actually died and the land had been divided amongst the heirs. The Block A extension worker said Agritex could only stick to the official list: if someone had died, the heirs should have reported it to the office for re-registration. She failed to mention that most irrigators do not do that because they would first have to pay up for the outstanding arrears in maintenance fees of the deceased.

It was agreed to call a general meeting to inform the people of the change in water schedules. After the meeting I facilitated an excursion through the scheme by car. One extension worker used the excursion to demonstrate her point that the IMC did not know what was actually happening in the scheme. Block D had very little acreage under irrigation. Block BN looked green.

The general meeting 1 week later was marked by accusations and counter-accusations of different plotholders over alleged water stealing by Block A irrigators and violators of the one-acre rule. Some sentiments were expressed denouncing the IMC.

Table 4.6 shows the number of registered plotholders and the size of their land holdings in block BN as per 16 June 1995. Out of the 80 registered plotholders, 10 had been irrigating more than one acre (the so-called violators of the one-acre rule). Nine plotholders had been deprived in the sense that they had irrigated none of their land. But then some of these people actually indicated that they did not want to irrigate beans, because of a lack of available labour. These data are based on records made by the water bailiff for block BN. However after the 16th of June, the bailiff had stopped making records. In his own words, the situation had become "too hot", implying that he felt his records could be used as evidence for favouring certain irrigators. By then block BN was in serious trouble: 1 day of water in each water rotation could not meet demands created by earlier times of plenty.

Table 4.6: Registered plotholders in block BN, plotholders and number of violators of the one-acre rule (16 June 1995)

Size (acre)	Plotholders (no.)	Violators	Deprived
0.25	5		
0.50	10		1
0.75	1		
1.00	32		8
1.25	0		
1.50	0		
1.75	0		
2.00	16	3	
2.25	1		
2.50	1		
2.75	0		
3.00	3	2	
3.25	1	1	
3.50	0		
3.75	2	1	
4.00	8	3	
Total	80	10	9

Source: Bailiff records, Block BN.

Despite their virtual non-involvement in any of the management decisions made by Agritex and the IMC, the bailiffs were the key actors in negotiating the actual water distribution in the blocks with the local farmers. In these daily negotiations the bailiffs not only had to deal with registered plotholders, but also with dryland farmers that rent plots, heirs of deceased plotholders and labourers that work on the land in bonded agreements with local shopkeepers.²² While Agritex staff, IMC and plotholders were having their endless meetings and discussions on water schedules and violators, the water bailiffs were concerned with the daily 'dog's work' of surviving, as water distributors in a different reality. The 'one-acre rule' in this world had quite a different meaning than in the administrative world of registered plotholders. Experienced bailiffs, like the ones working in block BS, did not register any of their water transactions in the form of records. The trick was not to leave any traces of these wheelings and dealings in the administrative world.

JUNE 1995: KEEP ON RE-SCHEDULING

June 1995 was the first month without pump breakdowns. No emergency meetings were organised. The protracted struggle in the blocks went on and so did the re-scheduling of water rotations. Block A irrigators made it clear to Agritex that they preferred the old system of water distribution. There was a good reason for that as Pearce and Armstrong (1990) have shown in their water study. Because of the geographical position of block A, its proximity to the water source, the old system of distributing water to several blocks at the same time gave them an advantage. Creative ways of demanding a greater share of the water for one's own block were developed.

On June 16, the Agricultural Seeds Limited organised a field day in Nyanyadzi.²³ The IMC chairman was roaming in block BS, his own block, calling upon people to turn up in big numbers during the beans 'feed day' to make a strong plea for 4 days of water for block B. During one of the entertainment intermezzo's at the field day, a local drama group performed a play in which another water schedule was proposed. In the play, some local block B and D farmers played themselves and the irrigation manager throwing different schedules at each other. After a fierce argument, one actor came up with the ideal schedule (3 days A, 4 days B and 3 days D). Dancing and shouting the number of days, the actors left the floor. Shortly after the field day the irrigation manager proposed a re-shuffle: 2 days A, 3 days B and 2 days D (easy to implement, a 7-days schedule). Kraalhead Dirikwe, plotholder in block A, replied with his schedule: 3 days A, 4 days B and 2 days D. His proposal was met with an overwhelming applause from the floor.

While different sets of actors were rallying for a change in the schedule, the situation on block BN had become tense. The prolonged vote of only one day in any rotation schedule, had created problems. To evaluate the seriousness of the problem, I calculated the irrigation intervals for the block. For beans in natural region V, in general, an interval of at most 14 days is recommended depending on the water-holding characteristics of the soil.²⁴ Beyond 14 days the crop starts suffering from moisture stress, which in turn results in yield reduction. The actual number of days that people had to wait for their second turn of water, after having received their first (irrigation interval 1), was on average 33.5 days, varying from 14 to 60 days. A third turn of water was by 16 June still a fantasy for some of the plottolders. If we assume that they received water on the first day of water for block BN after 16 June, the second irrigation interval took on average 23.5 days, varying from 7 to 58 days.

Asked for comments on these figures, the irrigation manager and one of the extension workers, were not dissatisfied. Normally they would recommend a maximum of 4 weeks (28 days) in between turns. The local irrigation officer was shocked to hear of such large intervals. He had learnt that 7–14 days depending on the soil quality and climatic conditions were the limit. An irrigation specialist at the

provincial office was equally shocked. These reactions clearly show that high level staff who have undergone some form of training in irrigation scheduling have clearly different ideas of crop irrigation water requirements than the average extension workers and irrigation managers who manage the schemes on a daily basis.

JULY 1995: DAMN THE PUMPS

Despite the continuous hassle with the irrigation schedule, the bean season was now in full swing. The majority of people were seeking their third turn of water for beans or harvesting the crop and some were looking for their first irrigation turn for wheat. Pumps had been down for the last time on 16 May. Then on 10 July the only remaining pump was stopped, as it was leaking badly. On 15 July, just after starting the engine, the top rod broke and the pump house remained silent for nearly a month.

History of pumps in Nyanyadzi

The first pump station for the Nyanyadzi scheme was taken into operation in 1957 with a maximum capacity of 85 lps to augment the water supply to the expanding scheme.²⁵ The pump house was located in a low area, surrounded by a protection wall, near the confluence of the Nyanyadzi and Odzi rivers. The number of diesel pumps was increased over the years. By 1976 there were 6 pumps, of which 5 could be operated at the same time, with a total capacity of 212 lps. Then it was argued that an additional pump was required to jack up capacity to 356 lps, compensating for a decreasing Nyanyadzi flow.²⁶ However, in 1980 the pump capacity was still 212 lps and it was argued that the 4 old pumps should be replaced by one new pump to economize on fuel costs.²⁷ Reports on the pump plant stress its increasing unreliability over time: regular breakdowns, lack of fuel, and submergence on two occasions before 1980 by Odzi river floods.²⁸ In the 1980s most of the water into the scheme was provided by the dwindling Nyanyadzi river flow (Pearce and Armstrong, 1990). By the end of the decade most pumps were out of order.

A new pump plant had been surveyed in 1983 on a high rock formation north of the Nyanyadzi confluence with the Odzi.²⁹ Two pipelines would service both the Nyanyadzi night storage dam and the new irrigation scheme in Nenowhe. The story of the construction of the new pump plant is a long one. Deadlines were not met, funds were not available at the right time and finally when everything was in place by November 1991, it took another 15 months before the first testing of the pumps for commissioning was made. The plant consists of 4 Worthington turbine pumps (from the UK). The motors are mounted on top of a shaft with driving rod for the actual suction part that hangs in the pump sump, some 5 metres lower. The 2 pumps for Nyanyadzi cannot operate simultaneously and have an invariable pump capacity of 400 lps. During the first test run (February 1993) it was noted that all pumps suffered from overheating and excessive vibrations. A second test resolved the issue

of overheating. The excessive vibrations were never fully attended to, causing confusion over whether the pumps were actually commissioned. However, the grace period in a maintenance contract between the Department of Water Development and a private company, Stewarts and Lloyds was set to start on 14 February 1994.³⁰

Operation of the pumps

An overview of the number of hours pumped per day during the winter 1995 season is given in Table 4.7 and Figure 4.2 (above). As can be noted the pumps were operated for less than 4 hours per day during 35 per cent of the time.³¹ Only during 29.5 per cent of the days were the pumps operated for 12 hours or longer. The actual pump discharge was a mere 332 lps instead of the assumed 400 lps. Both factors resulted in a considerably lower in-flow of water into the scheme than was banked on by the scheme's management (12–24 hours pumping per day with a discharge of 400 lps). One wonders what caused this problem.

Table 4.7: Frequency distribution of daily pump hours at Odzi pump station 1 March–31 July 1995

Hours pumped	Frequency (days)	Time (%)
0	37	24.0
1	7	4.6
2	0	0.0
3	3	2.0
4	6	3.9
5	3	2.0
6	3	2.0
7	4	2.6
8	6	3.9
9	4	2.6
10	7	4.6
11	28	18.3
12	40	26.2
13	3	2.0
14	2	1.3
Sum	153	100.0

Source: Department of Water Development Odzi pump records

The pump shutdowns during March, April and May were mainly caused by a lack of water in the river. From 2–10 May the main valves of the Osborne dam were repaired, resulting in no water for Nyanyadzi, with a delay time of 5 days. In addition, occasionally there were not enough Agritex general hands deployed on the reconstruction of the feeder dam in the river that leads the water to the pump sump. However, the main problem was excessive vibration, which resulted in heavy leakage caused by worn out threads and bearings of the driving rod. The leakage might have led to a loss of suction power resulting in a lower discharge. Because of the leakage the pumps could not be operated for longer than 12 hours a day. In the end both pumps broke down and had to be sent to Mutare for re-machining. Pump number 2 broke down on 21 March and was re-installed only on 8 August. It broke down again on 18 August. Pump number 1 broke down on 10 July. Both pumps were still under repair at the end of the season (October 1995).

The main actors concerned with the pumps, the Department of Water Development and Stewarts and Lloyds, were by August convinced that there had been a design error.

These pumps have become a headache. First we had these problems with silt getting in the pump sump and now we are facing excessive vibrations. I will try to put in a stabiliser, but it would be better if a different set of pumps were installed: submersible pumps anchored at the bottom of the pump sump. But now we don't have money for that. I was involved in this design in the beginning (1983). At the time I recommended a pump capacity of 500 lps. Why we ended up with only 400 lps, I do not know.³²

An engineer of Stewarts and Lloyds, who spent most of his time on repairing the Nyanyadzi pumps, was also convinced that these pumps were in the wrong place: "Who would do anything on this pump station? I don't want to work here, in this hot place all the time. I would rather commit suicide, ha, ha."³³ A former irrigation specialist for Agritex Manicaland said that the type of pumps was wrong:

It makes no sense to put turbines in a sandy situation like that. At the time (of design) I made a plea to take Golds pumps (submerged). But those were more expensive. The then director did not want them. Well, it was British aid of course. So they chose for British made pumps. You cannot criticize a gift.³⁴

There remains the question why it had to take four and a half months to repair a pump. A Department of Water Development engineer explained that the problem was that the maintenance contract with Stewarts and Lloyds contains no penalty clause. If Stewarts and Lloyds failed to repair the pumps within a certain time, they are not liable for the crop loss. But there are other ways of 'pushing' the work according to the engineer:

As employers we can delay payments. But now in this case, because Stewarts and Lloyds has to do the work under the grace period according to Department of Water Development, we are not going to pay. That is what the wrangle is about. And that is also the reason why Stewarts and Lloyds take about a month's time or even more to repair that pump.³⁵

AUGUST 1995: SHOWDOWN, WHO TO BLAME?

The scheme and its crops were heating up. A dry spell of 3 weeks had brought most farmers to despair. The scene was set for a dramatic climax of the season. With another horrible water season drawing to a conclusion, the irrigation manager attended a meeting in block B in a last 'all out' effort to correct old misconceptions. He had obviously prepared his speech very well. After congratulating the block B irrigators with their farming performance and thanking them for paying their maintenance fees,³⁶ he told the audience that

the dead may rise, if you believe it. The spirits of the deceased may not be pleased with the behaviour of the heirs. If your deceased father had any outstanding fees he will not be happy. You cannot take only the good things of your father. He paid for your education and made you into the person you are now.

He explained that Agritex could only work through the list of registered plottolders. "Those whose names are in the register are those who are going to be given water."

In his speech the irrigation manager tried to appeal to both Christians and non-believers by extending the theme of the "dead may rise". He showed his abilities to play with the consciousness of people in order to make his point: please register and pay up the outstanding arrears. His plea was underlined with a threat: "if you don't register you won't get water."

The effects of his speech were demonstrated the following days. Many people from block B came to pay their maintenance fees. In August-September 1995 six plottolders changed registration and split the land into two or three different plots, as compared to one change in the whole of 1994.

During the final general meeting of the season on 2 August, most irrigators could not conceal their anger any more. Most of them reaped a disappointing bean harvest or nothing at all. The wheat that had been planted in the beginning of July was withering on the land. After an initial revolt against the IMC who were discarded as a bunch of window dressers, the fury turned towards Agritex. They were accused of staying in their offices while the crops withered, receiving maintenance fees while not maintaining the scheme, being land development officers while not developing the land and withholding irrigation to those who fought in the war for the very right

to acquire irrigated land. The old hobby-horses of lack of communication, overriding bureaucracy and failing supervisors were displayed in various forms. At a certain moment the floor demanded to see the topmost official. The irrigation officer who had initially ducked, was dragged in front of the meeting. He once more explained Agritex' position with regard to the pumps, the lack of general hands to do proper maintenance and the failing approach of the IMC. The meeting ended in chaos.

Considering the unreliability of crop yield data provided by Agritex, I estimated crop water demand and water supply during the winter season for block BN. Serious water shortages were experienced in the beginning of June and from mid-July onwards (Figure 4.3). This resulted in a below normal yield for beans planted at the end of March (8 ha); significant yield reduction of beans planted halfway through April (17 ha) and no or very scant yield for beans and tomatoes planted in May (3 ha). The wheat that was planted from the beginning of June onwards (over 7 ha) yielded nothing at all.³⁷

After a short-lived revival of one pump (9–18 August) the pump house closed down for the final time. Another winter season had passed in Nyanyadzi irrigation scheme.

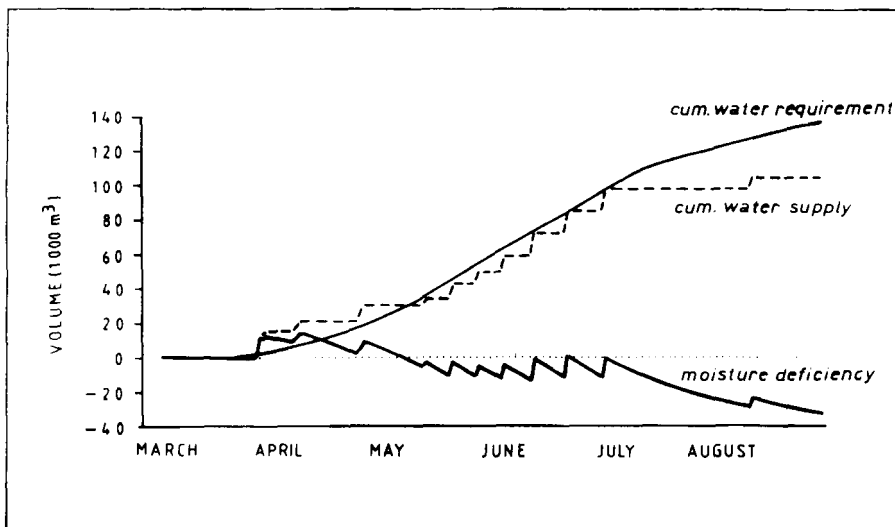


Figure 4.3: Crop water requirement, water supply, and moisture deficiency, March– August 1995, block B North

CONCLUSIONS

At the start of the season, the scheme's management and irrigators knew that a shortage of water was bound to occur. It was then decided by the scheme management

to pursue two water saving measures: (1) cutting total acreage under irrigation and (2) devise a different water-scheduling method to increase water availability to individual blocks.

The actual implementation of the 'one-acre rule' was in the hands of the water bailiffs who tried to mediate between a faulty list of 'official' plottolders and the plottolders, leasers, heirs and labourers they actually met on the ground. The many meetings between irrigators, Agritex management and IMC hardly affected this local process of negotiation on actual water distribution. Despite the fact that the cut in acreage had not been informed by decisions as to the actual number of plottolders, thus leaving room for adjustments in the blocks, it resulted in some decrease of plots under irrigation.

The new water rotation schedules which operated on the principle of concentrating water to one block and irrigating whenever the pumps were working, resulted in an improved availability of water at block level. It also re-dressed some historical imbalances that had been propagated by the old way of water distribution by reducing top end benefits for block A. During the season, the actual water rotation schedule remained an issue for (re-)negotiation by both Agritex staff, water bailiffs, IMC members and individual plottolders on varying grounds. The fact that the water rotation schedules were based on trial-and-error principles, instead of on water availability, crop water requirements and actual acreage, left sufficient room for every interested group (Agritex, IMC and plottolders) to participate in the discussion on water distribution in the scheme. This negotiation process took various forms: drama group, individual pleas in meetings and field days, and pleas from extension workers during management meetings. Communication through the official farmer representative body (the IMC) was hardly sought. Instead, IMC members made individual pleas in favour of their own block and irrigators tried to negotiate directly with the irrigation manager during meetings. In the process, some new schedules resulted in tense situations and avoidable crop loss in particular blocks (particularly in block BN). This could in theory have been avoided if the initial schedule had been attuned to the number of plottolders and acreage in each separate block.

The overriding problem of the season turned out to be the frequent pump breakdowns and not a scarcity of water from the Osborne dam. The ultimate failure of the pumps resulted in low bean yields and crop failure for the subsequent wheat crop. The crisis situation during the winter of 1995 allows some important conclusions to be drawn with regard to the operational complexities of the Nyanyadzi irrigation scheme.

First of all, the scheme's operation is very much dependent on its wider context. In a hydrological sense, the Nyanyadzi river has let the scheme down over time by supplying decreasing volumes of water and increasing volumes of silt. The remedy for this problem lies beyond the control of the local population and scheme's management. Equally remote for the local actors is the Osborne dam. Bureaucratic

procedures prevent local Nyanyadzi staff from interacting directly with the provincial water engineer in Mutare. Instead, strategies have to be sought to get to know how much water is available and when it is going to be released. Furthermore, the scheme cannot be seen in isolation from the numerous desperate dry landers in its surrounding area. Many more people depend for their survival on the scheme than are officially registered with Agritex. These people enter into lease contracts or contribute to a further expansion of the scheme by opening up lands at the scheme's edges. This adds to the organizational complexity of the scheme (increased number of irrigators) and contributes to an 'in-built' water scarcity situation (larger command area with same or even decreasing water supply).

Secondly, there is the technical infrastructure which is not particularly conducive for maintaining a secure water flow. Outstanding in this respect is the failing of the pumps, which represents a structural problem (design error) that no local actor in Nyanyadzi can master. Stewarts and Lloyds, a Mutare-based company, also does not seem to be able and willing to deliver prompt services in case of a breakdown. The Department of Water Development has no effective leverage to force Stewarts and Lloyds to quickly repair the pumps. The fact that Stewarts and Lloyds is not accountable to the ultimate water users, and that the Department of Water Development is quite remote from the Nyanyadzi water users and management, provides a gloomy perspective for the future water supply of the Nyanyadzi scheme. The scheme's complex infrastructure does not cater for the increasing dependence on pumped water supplies from the Odzi river. The infrastructure is wholly oriented to a reliable water supply from the Nyanyadzi river, as displayed by the fact that Block C cannot be supplied from the Odzi river, the difficulty in supplying water to one block in times of scarcity, and the need to have water flowing through a leaking night storage dam. In times of scarcity one would want to concentrate water in particular canals and to particular blocks at particular instances, for example, when the pumps operate to economize on conveyance losses. However, the Nyanyadzi water works are unwilling in this respect.

Thirdly, the number of people involved in the actual management of the scheme does not facilitate quick decision-making in times of scarcity. The fact that all irrigators have to agree on a water-rotation schedule, and the room for manoeuvre that is left at block level to accommodate the actual distribution of water, impedes easy and transparent implementation of water scarcity measures. The fact that the present management does not acknowledge the realities of the scheme in terms of number of plotters, its size, actual lines of communication, and the limited role and mandate of the IMC, does not help to facilitate the emergence of transparent arrangements to distribute water shortages in a reliable and equitable way. Furthermore, Agritex staff, however well versed in the rules and regulations concerning water management, have never been trained to deal with water scarcity situations.

Given all these adverse factors it is amazing that the Nyanyadzi canals, management and community still managed to reap some crops in the 1995 winter season.

DISCUSSION: WHAT IS NEXT?

In view of the present Government's drive to hand over management tasks to smallholder irrigators, and to operate the Department of Water Development on more commercial lines in the future Zimbabwe National Water Authority, a number of issues are discussed below relating to the future management of the Nyanyadzi scheme. For local managers to come up with effective management strategies a number of realities will have to be dealt with.

The basis for water scarcity control in the 1995 winter season was irrigable acreage. By cutting down the amount of land under irrigation it was hoped to achieve an equitable distribution of the available water. However, water being the scarce resource, scarcity control measures should have been based on the available water supply. This requires careful monitoring of water flows and putting in restrictions on irrigation water use in either time or volumetric allocations (cf. Tiffen and Harland, 1990b: 48). However, in the present set-up, such an approach could not have been taken, not only because the pumps were too unreliable to allow for accurate estimations of the available water supply, but also because the long-standing experience of the scheme's irrigators and managers told them that it was not feasible in a scheme of such complexities and dependencies.

With the present infrastructure, management skills and dependency on the wider context, it is not possible to come up with a time or volumetric system of water distribution during periods of water scarcity. At the moment nobody in the scheme can be expected to take a lead in this regard. Despite the availability of measurement structures in the scheme, nobody knows how to make use of them. The Agritex manager of today is better equipped to deal with agronomic issues than with hydraulic problems. Nevertheless, one would still want to know where the water at any particular moment is in the scheme, how many acres can be irrigated with a certain water supply, and how different water supply scenarios can be translated into reliable water schedules. The training facilities for gathering that experience are not available in Zimbabwe at the moment. Neither can local Agritex staff be expected to transfer these skills and experience to farmers' organizations by means of training IMC members. The people who might be expected to be able to train others in these respects, the irrigation specialists at provincial level, have no experience on the ground. Possibly outside assistance could provide for the much-needed training. However, even then, the infrastructural complexities of the scheme and the expenses incurred for setting up and maintaining a water-measuring network, would limit the possibility of creating a transparent system of water flow control.

From an organizational point of view, the management structure is, in principle, clearly defined. However, the dynamics of water management in the 1995 winter season clearly displayed its weaknesses. Communication lines are clogged by administrative boundaries and tedious procedures. On crucial water distribution issues the IMC is by-passed. In the end the management structure is unable to deliver the goods. The present structure calls for more flexibility and accountability. The situation at the pump house, however, undermines any future arrangement. The commercialisation of the water sector, however painful from a financial point of view, might well provide opportunities for new arrangements that prove more reliable, for example, the Nyanyadzi water users could enter into a maintenance contract for the pumps that includes penalty clauses. The present reward system within government departments leads to production of a lot of reports that take no account of the situation on the ground. Again financial hand-over of the scheme might help to instill another type of accountability that facilitates the emergence of effective management strategies.

Agritex staff have, in theory, sufficient backing from rules and regulations to safeguard the equitable, productive use of water in government schemes. However, its *de facto* role in daily management of the scheme is limited. This chapter has shown that despite the useful role of Agritex as an 'independent' arbitrator, actual water distribution is a matter of negotiations at block level between water users and water bailiffs. It is inevitable that some water users will benefit more from this situation, because of their endowment with resources, status or social networks. First of all, there needs to be transparency as to who the actual water users are. In the case of hand-over of the scheme to water users this question becomes paramount. The many different factions along which the Nyanyadzi community is split, and the sheer numbers involved in the scheme, does not allow for a smooth and quick hand-over.

Considering the political infeasibility of cutting the number of plottolders or the command area, the obvious thing to aim for in present circumstances is an increase in water and the reliability of its supply to the scheme. Nyanyadzi irrigators are in favour of the construction of a dam on the Nyanyadzi river rather than opting for more pumps on the Odzi river, because the latter will be more expensive to operate. However, a dam on the Nyanyadzi river might prove to be very expensive and environmentally unsustainable due to siltation. The option to sink boreholes in the Odzi river bed, equipped with locally manufactured pumps for each block, is more expensive to run but solves a number of present-day complexities. With each block having its independent water source it would be easier to estimate how much water is available. The number of water users depending on the source would be less, making it easier to control water flow and to determine the actual number of plottolders. It would also facilitate local decision-making in a meaningful, accountable and transparent way. With smaller units under irrigation it would even be possible to arrive at time- or volume-based water shares. In such a case Agritex'

presence would still be called for to provide overall arbitration and (technical) agronomic advice, but the main management tasks would be in the hands of the water users.

NOTES

1. I wish to express my sincere gratitude to the Agritex staff in Nyanyadzi. Chimanimani and Mutare for their kind cooperation and open attitude towards my questions and queries. I also wish to thank the Nyanyadzi irrigators, members of the present Irrigation Management Committee and Department of Water Development staff in Mutare. Finally, I acknowledge suggestions from the authors of the other chapters of this book.
2. Personal motto of the irrigation manager of Nyanyadzi irrigation scheme [Field notes, 31–7–1995].
3. PC files, 1979.
4. No ‘block system’ (as examined by Manzungu, in this volume) is pursued in Nyanyadzi: irrigators in principle are free to grow the crops they wish; consequently, in each block a wide variety of crops are grown, at varying stages of development.
5. Interview with Kraalhead Dirikwe, May 1994. Dirikwe said he was a young boy at the time and was looking after the oxen span that drew the line for the future canal.
6. National Archives of Zimbabwe (NAZ) file S1542/W5/2 (Native Affairs); letter from ED Alvord to Chief Native Commissioner, dated 30 September 1937.
7. S.G. Woodworth, Nyanyadzi irrigation scheme. Unpublished report. DEVAG, 1971, p.1.
8. See PC files. 1968–1978; and Woodworth, Nyanyadzi irrigation scheme; p.2.
9. To add to this, the amount of rainfall in the upper catchment shows a clear downward trend over the years 1899–1995 (Chimanimani District Administrator’s office recording). However, the rainfall in Nyanyadzi itself seems stable, though highly varied. No negative trend in rainfall can be statistically proven for the period 1942–1995.
10. His superior, the agricultural extension officer, is the *de facto* irrigation manager, having received a short course in irrigation. However, as the supervisor is normally more involved in the daily running of the scheme than the extension officer, farmers and local staff often refer to the supervisor as the ‘irrigation manager’.
11. This farmer committee consisted of local kraalheads and other prominent members of the community. In Nyanyadzi, a kraalhead committee was established as early as 1958 [Field notes, 16–6–95]. In 1968, a local businessman was co-opted in the committee as the secretary and only non-kraalhead [Field notes, 13–2–95]. The kraalhead committee gradually spread its wings to deal with more issues than irrigation water only. During the war, when the scheme was officially closed, they took over the management of the scheme and of the local training centre. They issued out the land of the training centre to relatives and other prominent members of the community [Field notes, 13–2–95]. In 1983, these committees were dismantled and replaced by IMCs.
12. ‘Farmer’s meeting held at Nyanyadzi, 11 March 1994’. Minutes by agricultural extension worker. Agritex, page 1.
13. In a later interview the district agricultural extension officer expressed his surprise in slightly different words: ‘This was a clear example of the dependency syndrome, which

the Nyanyadzi irrigators suffer from. I cannot understand why people do not organise themselves to go and de-silt the pumps, when they see their crops withering" [Field notes, 2-2-95].

14. 'Farmer meeting held at Nyanyadzi, 11 March 1994', p.1-3.
15. Field notes, 15-11-95. Life for the extension officer did not become easier after that. With his action of transferring the general hands in mind, an anonymous writer sent a letter to the chief agricultural extension officer requesting his removal from the scheme. The letter was sent back to the Nyanyadzi office, and presented at a general meeting of the IMC. Nobody wanted to admit to be the writer, despite the fact that it represented the silent sentiments of many irrigators. When construction work of the new Nenowhe scheme was stopped in January 1995, because of lack of funds, the extension officer again faced the full brunt of anger of the Nenowhe irrigation community. Women protested in front of the local Agritex office, denouncing his person and singing that they would make a coffin for him. The officer: "these people actually want to see me dead. How can I work with such people?" [Field notes, October 1995].
16. Field notes, 26-1-95.
17. Field notes, 26-1-95.
18. It must be noted that the author played a role too. I had suggested that water could be saved by pumping water straight into the canal network, instead of having it stored in the night storage dam, which is reported to be leaking badly.
19. Conex was the Department of Conservation and Extension it existed before independence.
20. Apparently a water conveyance efficiency of 50 per cent is assumed. Why block B can irrigate 58 ha with the same amount of water that block A uses for 30 ha is not clear.
21. DC records, 7-3-1968.
22. Pijnenburg and Richters (1996: 41-5) give a more detailed account of these negotiations and trade-offs between water users and water bailiffs.
23. This was part of the deal with Nyanyadzi irrigators. Agricultural Seeds Limited were to fund the food and drinks on the field day. They also financed the trophies for the farmer competition.
24. The *Agritex Irrigation Manual* (1994: 789) mentions an exemplary irrigation schedule for beans irrigation intervals of 4-7 days. This table was also referred to by the Agritex extension officer in Nyanyadzi.
25. Woodworth, 'Nyanyadzi irrigation scheme'.
26. 'Nyanyadzi irrigation scheme. Proposed pumping augmentation scheme from the Odzi river for the present irrigated area.' Letter from the principal agricultural exterior officer, irrigation [Danby] to the provincial administrator, dd. 16 February 1976.
27. 'Nyanyadzi irrigation scheme. Proposed modification of pumping scheme.' Letter from provincial water engineer [Groenewald] to deputy provincial agricultural exterior officer, DEVAG, dd 29 April 1980.
28. PC files, 1971-1980.
29. The first proposal for construction of a new pump house on this location dates back to 1971. See Woodworth, 'Nyanyadzi irrigation scheme'.
30. Letter with information on Nyanyadzi/Nenowhe irrigation schemes from the provincial water engineer to the director of the Department of Water Development at the latter's request, dd. 23 March 1994.

31. If August 1995 is included this figure rises to 40 per cent of the time with less than 4 hours pumping per day.
32. Personal comm. provincial water engineer, dd. 15-8-95.
33. Field notes, 2-8-95.
34. Field notes, 13-10-95.
35. Field notes, 15-8-95.
36. Both these accreditations are a bit false, however flattering they may sound. Block B had a large share of outstanding maintenance fees at the time. The performance of crops in block B was certainly below standard at the time (beyond control of most farmers though).
37. Crop water requirements were determined for block BN beans, tomatoes and wheat, for the different crop stages, using crop factors from Pearce and Armstrong (1990) and historical evapotranspiration data for Nyanyadzi (Agritex Manicaland files, 1989). Water supply to block BN was measured twice daily (morning and afternoon) for the period April-August 1995. Use was made of a Braystoke BFM002 Current flow meter. There were 4 measuring points (T1-4) which are shown on the Nyanyadzi map (Figure 4.1 above). T1 to T3 are located at the start of secondary canals in the block itself. T4 is at the distribution box at the edge of block A. For morning and afternoon measurements averages were calculated. Multiplying by the number of hours pumped gave the incoming volume of water. Crop water demand versus water supply were set out for values at the block edge to find the deficiencies in water (Figure 4.3 above). Crop water requirement before April 1 has been assumed to be nil in this graph, arguing that previous water demands had been satisfied by the then available flow. Crop water requirement was determined by assuming 70 per cent irrigation efficiency. The graph shows that there was an almost continuous deficiency in supply during the season, aggravated towards July and August when the total deficiency amounted to 35,000 m³.

The beans in Block BN planted by the end of March (8 ha) were harvested by mid-July. So besides an initial water shortage in mid-April and some water stress at the end of the mid-season stage (beginning of June), this crop was slightly affected, resulting in a yield lower than normal but not detrimental. The second lot of beans were planted by mid-April (17 ha). At the beginning of June this crop was at its mid-season stage. Water stress occurred during seed setting, so considerable yield reductions occurred. The beans and tomatoes planted in May (3 ha) received no water for about 25 days during mid-season stage. Both crops therefore hardly yielded anything. The wheat planted beginning of June (7 ha) was first affected by water shortage in mid-July when the crop was in its development. By mid-August the last trickle of water came in. Because of no water during flowering and seed formation, the crop yielded nothing.



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