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'Our humanism cannot be captured in the bylaws': How moral ecological rationalities and care shape a smallholder irrigation scheme in Zimbabwe

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Abstract

In this article, we bring concepts of institutional bricolage, moral ecological rationalities and care into engagement, to explain the everyday management of an irrigation scheme in Zimbabwe. In doing this we: (a) emphasise the constant processes of bricolage through which irrigators adapt to changing circumstances and dynamically enact irrigation management; (b) illustrate some of the key features of the contemporary, hybridised moral-ecological rationalities that shape these processes of bricolage; (c) show how motivations to care (for people, the environment and infrastructure) as well as to control shape the bricolaged management arrangements. Through this approach, we aim to contribute to expanding ways of thinking about rationalities, including those that express the aspiration to live well together with human and non-human others, including water and infrastructure. The focus on moral-ecological rationalities is central to our contribution to critical water studies. This sheds light on actual practices of governing water and relationships between society-water/people and the environment. In so doing it helps us to understand the possibilities of caring for natural resources.

Keywords

Care, institutional bricolage, smallholder irrigation, moral ecological rationality, Zimbabwe

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Introduction

> You see [a long pause]… you would not understand it. When we started this cooperative, we had these bylaws, and for a time they were followed religiously, and were read every morning as a reminder of what was expected of every member, but these bylaws partly led to the failure of the cooperative farming. Look, we are human beings and not machines; we feel responsible for one another. Our humanism[1] cannot be captured in the bylaws, we have a culture, relations, religions, beliefs, elders, widows, and a society to care for. These we live by every day, which these blueprints cannot capture. To be honest, we use the bylaws and related documents mainly for strategic reasons like accessing funding or affiliating to funding organisations and for structure or organisation, but in everyday practice, we draw from our humanism. For long after we abandoned cooperative farming, we did not have the bylaws or made reference to them to the extent we had nothing in 2016, and we had to declare they were lost, and the Ministry of Cooperatives prepared a new document. Even when voting, people do not vote for competency but for people who will uphold what we stand for as a people, not robots who can refer to bylaws. (Mr Jambo[2], Secretary of Rufaro Irrigation Scheme)

These are the words of the secretary of the Rufaro irrigation committee, a cooperative of smallholder farmers that jointly operates an irrigation scheme in the south of Zimbabwe (Chitata et al., 2021). His narrative raises some pertinent questions. Why does he claim that the bylaws lead to the failure of the cooperative? How does the humanism – which he refers to – shape irrigation practices? And why can this humanism not be reflected in the blueprints and bye-laws? It is widely documented that irrigation schemes often perform differently than designed, both in terms of the level of production (e.g. water consumption, crop yields) as well as in everyday functioning. Mr Jambo's narrative suggests this might be so because of the disjuncture between the guidelines designed to operationalise the scheme and the hybrid arrangements which develop in the everyday practice of irrigating the fields. For example, the membership of the irrigation scheme is fixed at 55 members (defined boundaries); however, in practice, people sublet their plots to relatives or subdivide plots amongst family members to share the property of a deceased registered member.

Furthermore, the secretary of the irrigation scheme seems to counterpose introduced bylaws with pre-existing socially embedded arrangements, yet empirical studies suggest that irrigation management is often shaped by the piecing together of introduced rules and culturally acceptable social norms, beliefs and practices (Bavinck, 2020; Cleaver, 2012; de Koning, 2011). We refer to this process as institutional bricolage[3], in which a blending of different elements creates (un)intentionally hybrid institutions – and enactments in practice – often serving multiple purposes (Cleaver, 2001, 2002; Cleaver and De Koning, 2015; Jones, 2015; Karambiri et al., 2020). The concept of bricolage as developed by Levi Strauss in 1967 has evolved and has been applied to a growing body of studies of environmental governance (Nunan, 2019; Nunan et al., 2015; Karambiri et al., 2020). Scholars who are interested in critical institutionalism use the conceptually specific formulation 'institutional bricolage' for its ability to clarify processes, social relations of power and meaning in everyday practices (Benjaminsen, 2017; van Mierlo and Totin, 2014; Verzijl and Dominguez, 2015). In relation to irrigation, studies deploying an institutional bricolage lens have highlighted a number of processes. These include how different institutions emerge, coexist and persist in irrigation management (Wang et al., 2021), how irrigation policies are shaped by historical and overlapping layers of governance arrangements (Sehring, 2009) and how overlooking cultural and social practices in favour of formal institutions leads to suboptimal outcomes in communal irrigation (Sakketa, 2018).

In our analysis of irrigation management, we draw on some key elements of institutional bricolage thinking: (a) the need for everyday pragmatic adjustments, (b) the blending of rationalities and logics from different origins and (c) the requirement for bricolaged arrangements to be invested

with authority and legitimacy, in order to work. Therefore, the institutional bricolage lens deployed in this article helps explain how rationalities derived from different sources react and hybridise. With this in mind, we interpret the Secretary's words as suggesting that the everyday practices in the Rufaro irrigation scheme are partly shaped by bylaws, but also based on rationalities related to the spiritual experiences and socially embedded morals of the irrigators. Despite their relevance for understanding everyday management practices, these socio-cultural rationalities are often overlooked in the mainstream[4] literature on irrigation. The dominant literature on a wide spectrum of irrigation research that has been published, including in Zimbabwe, focuses on designs and scheduling according to hydrology, engineering and agronomic principles (Gu et al., 2020; Meinzen-Dick et al., 1994), irrigation transfer in different parts of the world (Rap, 2006; Senanayake et al., 2015; Svendsen and Nott, 2000; Vermillion, 1997; Vermillion and Sagardoy, 1999), histories and practices of managing smallholder irrigation schemes (Manzungu, 1999; Moyo et al., 2017; Rukuni, 1988) and evaluation of irrigation management based on Ostrom's design principles (Bastakoti and Shivakoti, 2009; Kamran and Shivakoti, 2013; Nkoka et al., 2014; Sarker and Itoh, 2001). Based on our reading of the prevalent literature, we argue that it is primarily (though not exclusively) concerned with technical and management issues, driven by efficiency considerations and overlooks the importance of other ways of engaging with water (Zwarteveen et al., 2017, 2021).

The focus of mainstream irrigation literature on technical and managerial issues means that there is a tendency to overlook, minimise or demonise vernacular logics and practices. Different strands of literature in critical water studies go some way to address this gap. For example, studies undertaken from an ethnographic approach highlight the ways in which water and irrigation management is influenced by socio-ecological values and beliefs (Vijfhuizen, 1996, 1998, 2003) as do many of those undertaken from a feminist political ecology perspective (Bellanta, 2008; Harris, 2006; Palmer, 2015; Wutich et al., 2018; Yates et al., 2017). However, it has been noted that there is a tendency in literature inspired by political ecology to romanticise such vernacular logics and practices, overlooking their potential for reinforcing inequitable social orders (Cleaver 2018; Cleaver and Whaley 2018). Our approach in this article navigates a path between these different approaches. By deploying the concept of contemporary 'moral-ecological rationalities' we are able to demonstrate how people practice irrigation management by drawing on social resources with variable effects both the functioning of systems and for inclusion and equity.

In this article, we study the 'culture, relations, religions, beliefs, … society and care' that Mr Jambo refers to through the lens of moral ecological rationality. Moral ecological rationalities play a significant part in Cleaver's conceptualisation of institutional bricolage (2001, 2002). She suggests that people's arrangements for managing natural resources are often shaped (consciously and non-consciously) by moral-ecological logics. In such understandings, human actions are shaped by, and have consequences for people-environment relationships, including spiritual understandings and experiences of these relations. So, for example, conflict amongst people in a community may incur the wrath of the ancestral spirits, who then withhold the rains so that the people's crops fail, their wells run dry, and they fail to prosper. In this article, we find it useful to use the term moral ecological rationalities to think through how people make sense of the world and legitimise particular social orders and distributions. Moreover, the concept can shed light on how different rationalities provide a wealth of mechanisms and elements from which institutional arrangements can be fashioned and legitimised. By reference to moral ecology framings, new or adapted arrangements can be seen as the 'right way of doing things', mirroring natural orders, invested with the authority of routine, precedent and the approval of human and/or spiritual authorities. In this way, culture, tradition and everyday livelihood imperatives become enmeshed with broader social relations of power.

In our deployment of the moral ecological lens to understand the dynamics of the irrigation scheme, we do not see such rationalities as complete thought systems, solely rooted in tradition

and a foundational link between people and nature (Bonelli, 2015; Iwaniszewski, 2009). To us, these rationalities are not primarily pre-modern, or traditional beliefs, but rather contemporary hybridised understandings that include blended logics, including the rationales of modernity (Comaroff and Comaroff, 1993). For example, Vähäkangas, writing about how beliefs shape people's practices in contemporary Tanzania, refers to the dynamic intersection of elements of traditional, Christian and scientific lifeworlds (Vähäkangas, 2015). These co-exist, *blend* and re-form, sometimes in tension, sometimes harmoniously. In our case study of Rufaro irrigation scheme, the everyday practices testify to the intersection of these elements. For example, irrigators might consult prophets of the Pentecostal church *and* the traditional healer to help with prosperity/profits in the irrigation scheme.

As we will show in this article, hybridised moral rationalities significantly shape everyday life, including irrigation practices. In our view, different elements blend in the enactment of irrigated agriculture and become entangled through the constant negotiations, interpretations and rearrangements needed to respond to challenges in everyday life (Scheitle and Corcoran, 2020). Using this approach, we show how it is through these hybridised rationalities that irrigators make sense of flows of water and the social relations of power among them, and how this informs their actions in the irrigation scheme (de la Bellacasa, 2017; Puig de la Bellacasa, 2011).

To further enrich our bricolage-informed analysis, we find it useful to mobilise the concept of care to account for more relational, connected and intimate ways of engaging in irrigation. With this aim in mind, we recognise that sentiments of love, responsibility and concern too often get overshadowed by concerns about control, competition and distrust in water studies. By drawing on feminist perspectives which foreground relationships of care (Gibson-Graham et al., 2016; Sato and Soto Alarcón, 2019), we aim to highlight how attempts to control water are not driven solely by control-for-profit motives, but can also be inspired by other reasons and desires.

The concept of care has been widely used in the health sector to investigate how people care for others (Bacigalupo et al., 2005; Leininger, 1988). Drawing from these approaches, feminist scholars have applied the concept to understanding how people care for the environment and what this tells us about socio-nature relations more broadly (de la Bellacasa, 2017; Harcourt and Nelson, 2015; Saxena et al., 2018; Singh, 2017; Zwarteveen et al., 2021). This literature recognises that humans and nature are mutually influencing and 'culture and nature are intertwined, both materially and conceptually' (Saxena et al., 2018: 55). The concept of care is used to study a 'genre of activities [affections, intimate ways]… drawing together the emotional engagement of being concerned and the practical engagement of contributing to restoring, sustaining, or improving something' (Mol and Hardon, 2021: 185). This approach seems well suited to exploring the everyday management of irrigation schemes in which pragmatic, mundane and incremental adjustments are made, often enacted in labour-intensive and physically demanding work. Such management can be seen as ongoing attempts to sustain or improve the flows of water and nurture the crops (Fisher and Tronto, 1990). We argue that the care lens could enrich critical studies of irrigation-in-practice and also further bricolage perspectives. It allows us to highlight some of the logics and assumptions embedded in moral ecological rationalities and how they often blend with – or are imbued with – notions of control and relations of power. In these ways, the concept of care lens helps us untangle hybrid arrangements for managing irrigation and tease out different ways of understanding and engaging with water.

The original contribution of this article is to bring concepts of institutional bricolage, moral ecological rationalities and care into engagement with each other to offer insights into the management of an irrigation scheme. In doing this, we: (a) emphasise the constant processes of bricolage through which irrigators make sense of changing circumstances and dynamically enact everyday irrigation management; (b) illustrate some of the key features of the moral-ecological rationalities that shape these processes of bricolage and (c) show how motivations to care shape the associated management arrangements in addition to – or mixed with – attempts to control. By bringing these concepts

into conversation, we contribute to novel ways of thinking about rationalities, including those that express the aspiration to share and live well together with human and non-human others (Haraway, 2014). This is central to understanding actual practices of governing water and might also open up room to explore other ways of sharing and caring for natural resources and imagining more just and sustainable futures.

In this article, we show how hybrid moral ecological rationalities shape irrigation water management through processes of bricolage. In the next section, we give a brief thumbnail sketch of the contemporary moral ecological rationalities of the irrigators in the Rufaro irrigation scheme. We emphasise their hybridity, their central focus on cause and effect relationships, and how they can reinforce particular social and political orders. In the section *Caring for infrastructure, algae, soil and groundwater*, we use this understanding to explore the ways in which irrigators actively maintain the infrastructure and water flows in the irrigation system based on moral ecological rationalities and care. In the section, *Explaining breakdowns: The Chief, angry spirits and necessary rituals*, we show how farmers explain breakdowns in infrastructures, and unpleasant events, by drawing on moral ecological explanations. In the section *(Re) negotiating bylaws, norms and everyday practices through bricolage,* we show how irrigators bring various institutional elements and sources of authority into negotiating and contesting everyday practices in the irrigation scheme. Thus, moral ecological rationalities intersect with the bylaws and the norms of Christianity through bricolage processes. Finally, we conclude the article with a reflection on the insights generated by bringing the concepts of institutional bricolage, moral ecological rationalities and the ethics of care into engagement.

Characterising contemporary moral ecological rationalities in Rufaro

As set out in the introduction, a focus on the moral ecological rationalities that shape the practices and relationships of irrigators in the Rufaro irrigation scheme helps us to better understand how it functions. The irrigation scheme uses groundwater and it started as a farm owned by a white settler during colonial occupation. The farmer was irrigating cereal crops on 80 hectares of land, and the cereals were used for cattle feeds. In 1983, after independence, the farm was taken over by the Zimbabwean government. A few years later a farming cooperative was established that allowed smallholder dryland irrigators to be relocated to this farm to collectively grow crops, mainly maize, cotton, wheat and horticultural crops. These irrigators came originally from Gutu, Zaka, Masvingo and Bikita districts in Masvingo province, which is predominantly occupied by the Shona people of the Karanga dialect.

From this group of irrigators, who also do dryland farming, we collected data using ethnographic methods. These included interviews with 40 irrigators (amongst them were traditional and church leaders) who were selected using a stratified random sampling technique. The narratives of the interviews with the farmers were coded (F1 to F40), and these codes are used in the article as a footnote to identify the farmers interviewed. The farmer interviews were complemented by interviews with 10 irrigation engineers (selected using a convenient sampling technique based on accessibility and availability) (coded GE1–GE10) and two government personnel from the Ministry of Women Affairs, Community, Small and Medium Enterprise Development (coded GO1–GO2). In addition, the data were triangulated through participant observations, four focus group discussions with the irrigators and secondary historical records. The interviews were conducted between June 2019 and October 2021 after ethical approval (reference number 027811) by the University of Sheffield Ethics Committee, and the data were analysed using thematic analysis (Braun and Clarke, 2021).

In the beginning, the smallholder irrigation farmers used an open canal system for irrigation, which was later replaced with a pressurised piped system. Nowadays, seven electricity-run

pumps supply groundwater for the irrigation scheme. This water is stored in a concrete tank from which it flows through buried pipelines to different parts of the irrigation scheme. These pipes are fitted with gate valves at regular intervals to control the flow and hydrants through which water is released to the irrigation fields (see Chitata et al., 2021: for detailed historical account of Rufaro Irrigation Scheme).

In the area where the Rufaro irrigation scheme is located, moral ecological rationalities inform everyday life and references are often made to the ways that God, the ancestors and spirits affect nature. Our data shows that they also significantly shape farming and irrigation practices. In this brief characterisation, we pick out some of the key features of contemporary moral ecological rationalities that help shape our subsequent discussion of water dynamics (Fontein, 2008). We explain in the following section how these moral ecological rationalities are blended from elements of Shona traditional belief, Christianity and the imperatives of government, development and modernity.

Moral ecological rationalities are hybrid and hierarchical

The majority of people residing in the Rufaro area practise Christianity alongside moral ecological beliefs derived from Shona cultural traditions. They have blended and adapted these two belief systems and most people believe that both religions share the same God (Mwari). This mingling of elements of different thought systems results in a hybrid amalgam of values and morals relating to right and wrong, love, care, taboos, truth and justice. However, the elements derived from different sources also bring with them notions of hierarchy and social order. For example, the hybridised moral rationality upholds a patriarchal structure with gendered and generational ordering of society, which is also common to both Christianity and Shona tradition (Moyo, 2004).

In the contemporary moral ecologies that shape the practices of Rufaro irrigators, hierarchies in the spiritual realm are mirrored and connected to the social relations of power in society. In the spiritual realm, the hierarchy starts with God, followed by territorial ancestors, then family ancestors and finally spirits residing in nature at the lowest rank of the hierarchy. The hierarchies in society and in everyday life are reflected in the lines of communication between the real and material world (as perceived by humans) and the spiritual. It starts with the Chief or a senior member of the household of the chief, referred to as Mhondoro, who is believed to mediate between God, the territorial ancestors and the community. At household level, a senior family person or conduit, referred to as Mudzimu, is believed to mediate between the family ancestors and the living family members. Also, the spirits in nature communicate to the people through Mudzimu or unusual happenings in the society. As such, within Shona traditional beliefs, at every level a specific human being acts as a conduit with the supernatural realm. People visualise this person as an entity which the spirit of the dead regularly visits – or even inhabits – to speak to the people the will of the spirits, and ultimately of God (Lan, 1985). People's beliefs about the interconnectedness of different entities, is elaborated in in the following section.

Relational moral ecologies

In contemporary[5] Shona moral ecological beliefs, everything is relational and every entity has life, has a soul. Within Shona culture, 'life force permeates the whole universe and matter and spirit are almost inseparable in reality' (Taringa, 2006: 12). All things have a common ancestor for the Shona people, and as such, they believe that they are kin to 'all creatures, gods, spirits and nature' (Taringa, 2006). Within the Shona culture human beings are understood to be interwoven with their environment and related to animals such as wild and domesticated animals or to part of an animal such as the legs or heart (Shonhai et al., 2020). Because of the blending of different

belief systems, similar understandings and practices can be traced in Christianity, in which God is considered the fatherly source of all living creatures. In moral-ecological relationality in Rufaro, some of these kinship relations between humans and nature are reflected through totems[6] which are named after animals. These totems are important in the sense that they are thought to connect groups of people and individuals to the same spiritual realm (Govender and Mutendera, 2020; Merz, 2021). In the Rufaro area, only people of the *Ngara* (porcupine) totem are allowed to lead or conduct the rainmaking ceremony, and it's taboo for them to kill and eat a porcupine. Also, churches in the area make offerings to God under trees of symbolic significance or spiritual meaning in traditional culture. This is a prevalent practice across cultures in Zimbabwe, as Cleaver also observed it in the Ndebele culture (Cleaver, 2012).

Moreover, in daily life, these rationalities often manifest through mundane phenomena. Thus, significance and wider meaning is commonly attached to seemingly unremarkable events like seeing a particular animal, experiencing a minor ailment, dreaming or observing a particular curious behaviour in self or another human being. To the Rufaro people, these mundane occurrences carry in-depth meanings which can help to explain current events or anticipate situations that may emerge in the (near) future. Consequently, according to contemporary belief, everything in nature symbolises something important to human beings, and every constellation in the biophysical environment has a context-specific meaning (Muza, 2019). The perceived kinship to the world around them fosters a rationality amongst Rufaro irrigators that emphasises reciprocal relationships of care amongst people and between people and their environment. This relationship is constantly mediated by ancestors and spirits, and, as we will show in this article, incorporates obligations towards material things such as the irrigation infrastructure. The relationality in the moral ecologies also connects the territorial spirits, and natural resources ownership with local governance structures or apparatus of state governance such as chiefs.

Moral ecologies intersecting with governance through the apparatus of state governance

Administratively, chieftaincy is still influential in the case-study area, and the chief is still considered the custodian of communal land and the associated water bodies (Mazarire, 2008). The Chief is appointed through clan-based lineage and regularised or legitimised through the local government structures and serves at the pleasure of the president as stipulated in the Traditional Leaders Act (Zimbabwe, 1998) and the Communal Land Act (Zimbabwe, 2002). Prior to the late 1990s, the government was not actively involved in the welfare of Chiefs. However, in the current political constellation, the government incentivise Chiefs with salaries, vehicles and other privileges (Makahamadze et al., 2009). Thus, in practice Chiefs are now civil servants who have lost their independence and authority to the government (Alexander, 2018). Next in the administrative hierarchy are the headmen who preside over at least twelve villages and assist the chief in efficiently carrying his duties. The villages are administered by the village head who assists the headman in administrative duties. These functionaries work in close association with the Chiefs to govern the people and administer the political will of the government, including influencing elections (Chigwata, 2016; Makumbe, 2010). The assumed direct association of chiefs – as well as headmen and village heads who serve him – to the supernatural realm reinforces the authority they receive through their appointed positions. It increases their ability to work to implement government/the ruling party's agendas of remaining in power (Kurebwa, 2020). This is enhanced by the state authority they yield, legitimising their real or imagined supernatural connections. After all, those who oppose the government by challenging the Chief, also deny God's will and easily get blamed for any misfortune in society as they angered the spirits. The exercise of such blended authority can also strengthen lineage based social differentiation, where those people close to the chief's clan gain privileged access to water and other resources (Taringa, 2006). These hierarchies

are mirrored again in the supernatural realm as, when they die, the chiefs and their family members are believed to become higher, more influential spirits than other community members will become in afterlife. The authority of the chief and his associates is, therefore, formed in the intersection of supernatural beliefs (about lineage and spirits) and the governance arrangements of the modern state. This hybridised moral ecological framework permeates the milieu within which everyday irrigation practices take place. Simply put, the position of chief is hybridised – partly based on culture and tradition, partly based on political authority. Chiefs themselves act as bricoleurs, drawing on the logics and authoritative resources of these different domains to perform their role, and exercise power over their subjects. Whereas the chiefs use their relational supernatural beliefs to enact authority, irrigators use their contemporary supernatural belief to enact care for groundwater and infrastructure.

Caring for infrastructure, algae, soil and groundwater

In this section, we present the everyday practices of care for water infrastructure – repair and maintenance – and then expand to show how moral ecological rationalities shape these practices. In the process, we pay particular attention to the caring interactions with two components of the infrastructure in particular, the hydrants which regulate the flow of water from underground pipes into irrigators' fields, and the concrete night storage tank. We introduce the management of algae in the tank as a technical issue and then expand this picture to include other relevant dimensions related to relationships with spirits and ancestors and responsibilities to care.

Caring for the hydrants

Currently, the Rufaro Irrigation scheme uses a concrete night storage tank that supplies water through a pressurised pipe surface irrigation system. This system is largely underground, save for the hydrants and the steel-reinforced pipes for drawing water from the hydrants into the irrigated plots. The water used for irrigation comes from seven boreholes which pump groundwater to the concrete tank. Before 2018, the irrigation scheme still had an earthen night storage tank and lined canals that supplied water to the fields. The change of the infrastructure from open canals to a pressurised pipe system changed how irrigation is done and the daily practices of operating, repairing and maintaining the infrastructure (for detailed changes on how irrigation is done see Chitata et al., 2021). The work involved (cleaning the concrete tank, trouble-shooting for blockages which require digging to access underground pipes and sometimes digging out the pipes and reinstalling them) is often labour intensive, physically demanding and time-consuming. We consider these everyday interactions with infrastructure as practices of care as they often include maintaining, fixing or protecting the infrastructure to make the water flow (Buser and Boyer, 2021). The investment of irrigators in caring for the infrastructure does not seem to be solely informed by duty or the need for water, but also relates to a deeper sense of emotional attachment to the irrigation scheme as a place of belonging. One of the women who is well advanced in age expresses this as follows:

> we spend much of the time here in the irrigation scheme, it's a second home. Just like in a home where we care for utensils et cetera, we care for the infrastructure and look forward to returning to the irrigation scheme to tend for our crops and irrigation infrastructure [including the hydrants].[7]

The hydrant is one of the important infrastructural components in the current set-up of the Rufaro irrigation system. It connects the underground pipes to the world above the ground and allows for irrigation to take place. The engineers designed the hydrants to be 15 cm above the

ground. However, measurements on the hydrants' height show that the majority protrude to 30 cm to 50 cm above the ground. One of the irrigators who was actively involved in the construction of the irrigation scheme made the following remark about the height of the hydrants:

> These hydrants were supposed to be 15 cm above the ground, but the contractor came with these long hydrants. Maybe they are remainders from another project. Now we have a problem during tillage, they will get knocked down and get loose if we are not careful.[8]

The hydrants and their height are not compatible with the tillage practices of using the ox-drawn plough or – in exceptional cases of those who can afford it – a tractor. The ploughing equipment gets hooked to the hydrant when the farmer turns at the edge of the field and this has already frequently resulted in the loosening of the hydrant and subsequent leakages. To avoid this, irrigators have now surrounded the hydrants with rubble – from the removed concrete canals – and stones to make it difficult to plough in the vicinity of the hydrants. As one irrigator explained:

> These stones around the hydrants serve to protect it from ox-drawn ploughs and tractors during tillage. We took the stones from the rubble of destroyed canals and stones from outside the irrigation scheme. If we do not do this, the ox or the chains or the plough itself will hook the hydrant off, and water will gush through the opening or leak underground.[9]

These acts of putting rubble and stones around the hydrants do not appear on the repair and maintenance schedules of the irrigation committee and are not recognised as maintenance. Such mundane activities of caring for the irrigation infrastructure go unnoticed yet are essential in the infrastructure's longevity and help to supply a reliable flow of water throughout the scheme.

Despite the irrigators' efforts to protect the hydrants, occasional accidents still happen. These accidents are regularly explained by supernatural events or sightings that happen before or after the accident. As one farmer explains this general belief among the Rufaro irrigators: 'before an accident happens, there are signs of misfortune which should come and warn an individual to get ready'.[10] The irrigator continued by narrating an accident that happened on this plot that day: 'I had a dream two days ago. In that dream, I saw an unusual spider in my irrigation plot; and this spider is rare, and when you see it, it means something not good will happen. The spider I saw in the dream was at the edge of my plot when we arrived this morning, and I should have cancelled my plans to work on this plot today. But we ploughed despite the warning…that is the reason why this hydrant was knocked off by a tractor, no matter how careful we were'.[11]

This data shows that moral ecological rationalities influence how irrigators behave, carry out their everyday practices, and give meaning to everyday events such as an accident that damaged the infrastructure. The interpretation of a spider as an early-warning of unfortunate circumstances may serve as a way to emotionally prepare for an accident and/or to justify afterwards why the accident happened. However, perhaps more importantly, it also serves to maintain a working relationship between people involved in the accident. In this case, it avoided tensions between the farmer and the hired tractor driver as the farmer readily faults himself for not taking heed of both the sighting and the foretelling dream[12]. Some irrigators, however, take the different sightings seriously, and this shape how they engage with water and practice irrigated agriculture – for example, the sighting of algae in the night storage tank.

Algae management

Now we turn our gaze to the concrete night storage tank that stores water pumped up by seven boreholes. It is located at the highest point of the irrigation water supply system. It is usually filled with

water at night, contingent on the availability of electricity and the water is distributed for irrigation during the day. The capacity of water to dissolve nutrients and support other forms of life in interaction with the sun's energy results in algae growth in the tank (Lin et al., 2021). The algae accumulate in the night storage tank with time, and every few years, it will block the outlet of the tank. Also, when the water level in the tank is low, algae flows through the outlet, causing blockages in the pipe network.

To deal with the algae in the concrete tank, five irrigators volunteered to get into the slippery tank to remove the algae using shovels and buckets. The removal of algae is also important to keep the water in the tank reasonably clean for domestic uses if the hand pump which supplies domestic water is broken down. Although this maintenance is done at least once a year it is not easy. Five men take at least six hours to scoop out the dirt. One of the irrigators who was taking part in the maintenance of the night storage tank explained:

> We have been here for six hours now and this is not an easy task, it is slippery in here and dangerous but we have to do it even without gumboots. We must do it; otherwise the algae will reduce the capacity of the tank and, it will enter into the pipes and block them as we have been experiencing lately.[13]

Algae in the tank is not the only problem that calls for the care of irrigators. Debris, particularly stones and other solid objects of different sizes, are thrown into the tank by irrigators and (playing) children. This is because there are no steps on the tank to check for the water level and people cannot easily look into it. Thus, the irrigators and children throw stones over the top of the open tank to check if there is water. The algae and the debris flows through the tank outlet and gets into the irrigation water distribution network. This is problematic because the objects get stuck at the gate valves or in the pipes from time to time, blocking the water flow.

The blockages due to algae and other objects lead to less water availability in the system for the irrigators. In cases of blockages – as noticed by low pressure or no water flow in the pipe outlets – irrigators will follow the pipe network around the irrigation scheme, troubleshooting for the blockage. This involves opening and checking gate valves, excavating part of the pipe network and listening if water is flowing in the pipes. The choice of partly underground infrastructure complicates detecting leakages and blockages and the irrigators sometimes take up to six hours a day to detect the location of blockage. The work is usually done by two men who previously assisted during the construction of the irrigation scheme. The men involved in removing algae and troubleshooting the blockages volunteered to do that without any foreseeable incentive like advantaged access to water or financial benefit. Removing the algae in the tank and unblocking the pipe network is necessary for the water control points to function as expected. The location of the tank – elevated, fenced and with a wall of two metres in height – is visible from outside but the inner space is far removed from the other irrigators. This makes the care for the tank and removal of algae unnoticeable, and this means that the care of the tank and the algae removal can go unnoticed by irrigation authorities, and is not seen by them as forming part of operation and maintenance. In the same vein, the blockages in the pipe network are unpredictable, and their rectification unplanned and not explicitly acknowledged by the engineers and some irrigators, no matter how important it is for making the water flow.

The engineers and development agents involved in the irrigation scheme's design and construction consider maintenance as part of the irrigators 'contractual obligation as formalised in a memorandum that the irrigators signed'. As one of these engineers explains: 'This [referring to providing labour for operation and maintenance of infrastructure] is not negotiable as we have agreed that the irrigators will contribute 30% of the total value of the irrigation project in the form of labour'[14]. However, our data shows that the care for the flow of water and the infrastructure has little to do with the contractual agreements, nor is motivated by individual interests of securing water.

Instead, the irrigators explain that they engage in these labour-intensive activities because: 'When you get something from your ancestors it is your natural duty and obligation to take care of that which you have been given because the ancestors do no give fortunes more than once'[15]. Thus, these pragmatic and necessary acts of removing algae and the debris blocking outlets and valves, and desilting the downstream pipes are informed by the logics of paying homage to the ancestors. And this moral ecological rationality goes a long way in sustaining the irrigation infrastructure and maintaining water flows.

Correspondingly, in caring for the tank, the irrigators try to balance the respect for the algae as a life form which is linked to the spirits with the need to control their proliferation and maintain water flow[16]. This is so because algae's appearance in the night storage tank is believed to be a communication from the spirits to the irrigators that they are polluting the groundwater resources. In this case, the accumulation of algae in the tank is regarded as a sign that the water spirits are dissatisfied otherwise the water should be clear or with little algae. As one farmer explained; 'this algae bloom is too much, we never used to have it so plenty. It is a sign that the ancestors and water spirits are not happy about what the people did … and are doing to the water or land. We do not know what will befall us, only time will tell'[17]. The algae's presence signifies the pollution and anger of the territorial spirits. The irrigators take the communication from the spirits seriously and adjust their soil fertility management to reduce groundwater pollution. Irrigators now use more organic manure and ash in the irrigation scheme than chemical fertilisers. This is a choice irrigators make based on their understanding of the spiritual world and not on the training the irrigation extension workers give them. Besides, the advice of the extension workers is to a greater extent limited to the type of chemical fertilisers to use, when to apply and the application rates but not to where to use the fertilisers. One Rufaro irrigator – and dryland farmer – explains that chemical fertilisers are more widely used in dryland farming. This is because in the irrigation scheme there is a more direct interaction between groundwater that is pumped up for irrigation and that leaks back to the aquifer carrying nutrients[18]. This nitrification of the water becomes more visible for the irrigators through the algae blooms in the storage tanks. Conversely, in dryland farming, leaching of nutrients also happens but will end up in the rivers that wash away algae and/or serve as food in the ecological chain of the river system. Moreover, the case-study area has only ephemeral streams, and the irrigators do not see the direct effect of the pollution from the fertilisers as the streams are dry for much of the year. The logic of avoiding groundwater pollution so as not to anger the water spirits has also transformed fertility management in the irrigation scheme in recent times (from 2017 onwards). Not paying attention to sightings such as algae blooms and giving enough respect to the territorial spirits or their physical representatives such as chiefs can result in strange happenings such as illness or breakdowns of infrastructure.

Explaining breakdowns: The chief, angry spirits and necessary rituals

In this section, we show how the interlinked hierarchies between the spiritual realm and the Rufaro community shape the meaning given to the malfunctioning of infrastructure. We highlight how the expected behaviours – collective and individual – are interpreted in specific ways and in the process influence the care for water infrastructure. We also show how irrigators risk their safety to care for the water infrastructure and illuminate the relations of power – physical and spiritual – which often are overlooked and go unnoticed in some irrigation literature.

When the Rufaro Cooperative was established in 1983, it was registered as a private limited company independent of traditional jurisdiction. However, in accordance with Shona beliefs, the elders in the Rufaro Cooperative paid homage to the Chief and performed rituals to be accepted by the territorial spirits of the land under the Chiefs' jurisdiction. As one of the Cooperative's pioneers explained; 'We brewed beer, slaughtered a goat and a cattle and presented it to the Chief and

together with the spirit mediums they ritualised it to their ancestors and God'[19]. The cooperative members did this in recognition of the Chief as the traditional custodian of the natural resources, who is entrusted to administer the natural resources on behalf of the spirits and Mwari[20], as well as recognising the state-sanctioned legal status of the farm land[21]. From that time the Rufaro community was cooperating with the Chief in rituals and solving disputes among them and between them and other communities. During this period of good relationship, the chief appointed three village heads who served as helpers to the chief as well as contact people for the ruling political party. However, over time the Chief's authority over the people of Rufaro increased, and the community became split into two camps, one group loyal to the Chief and the other group against his influence. Those who were in favour of the Chief were either of the same totem as the Chief or had received favourable judgements in disputes as was highlighted by a former chairperson of the cooperative:

> The Chief was increasingly becoming powerful over us and we could no longer solve disputes amongst ourselves using our structures as Rufaro cooperative. People would appeal to the Chief after ruling by the cooperative. In most cases the appellant would win against the cooperative, and the losers [cooperative] would pay the costs in form of goats, sheep or cattle.[22]

The cooperative engaged the services of a lawyer to interdict the Chief from interfering with their affairs. This was based on the cooperative being a private limited company that is not an entity within the jurisdiction of the Chief. From that period the cooperative loosened its ties with the Chieftainship and the associated traditional rituals, including the rainmaking ceremonies. However, the village heads are still operating and sometimes are enrolled by the cooperative to enforce debt repayment. Although the current Chief is not actively involved in the scheme, he is still influential through the village heads who are accountable to the Chief and government. The broken-down relationship with the Chief is believed to be by proxy to be a broken relationship with the territorial and nature-based spirits. As such, the Njuzu water spirit is believed to be responsible for the malfunctioning of the water infrastructure between 2000 and 2015. As the former chairperson of the irrigation scheme narrated:

> After we severed relationships with the Chief our boreholes started breaking down, and the canals were as well breaking down. Even when we tried to repair them, they would only work for a few weeks and break down. We once replaced all the pumps with a donor's help, but they were burnt by lightning. The Chief, territorial spirits and the Njuzu are not happy, and they are retaliating. Even the newly equipped boreholes are facing the same problem, two of the boreholes are already having problems.[23]

The breakdown of the water infrastructure is believed to be the work of Njuzu, a water spirit linked to Chief's ancestors. The same Njuzu is said to have drowned a small boy in a nearby water pool, and these incidences are seen as signs to the Rufaro people that the water spirits are angry and need appeasement. These events led to the irrigators giving up on repair and maintenance of broken infrastructure, fearing the angry spirits would attack and cause accidents during the repair of boreholes. This was decided after two consecutive accidents during the repair of the boreholes in 2010. As one of the survivors narrated;

> I am lucky to have survived, I was almost hit on the head by a column of pipes but lucky enough they jammed before getting to my head and no one could explain how the pipes got loose, surely the water spirits are angry.[24]

One of the irrigators, who is also one of the village heads and as such of the same *Ngara* (Porcupine) totem with the Chief, believes the situation is better now and the territorial spirits and the water spirits have reduced their anger, but are yet to be fully appeased. The anger was

reduced because he carried out an individual ritual on behalf of the community: He explains: 'I brewed the beer and slaughtered a goat at the household level and took it to the shrine in the small mountain to appease the territorial spirits because the occurrences were getting out of hand'.[25] However, according to the village head, the community still needs to do their collective ritual.[26] Other irrigators, who are more actively involved in the local Christian church, were praying to God to normalise the infrastructural problems and attribute the current improved situation to prayers being answered by God, who is considered the overlord of the spirits.[27] Here the [individual and group] rituals and ceremonies are a form of care for the infrastructure.

(Re)negotiating bylaws, norms and everyday practices through bricolage

In this section, we show how moral ecological rationalities intersect with the bylaws and Christianity and how multiple institutions and personas are brought in to negotiate and contest everyday practices in the irrigation scheme. We also highlight how notions of care – for others – are emphasised in the bricolaged arrangements and negotiations in everyday practice. Furthermore, we highlight how the local bylaws from the farmers intersect with the local governance arrangements involving the lowest levels of local authority, together with the invocation of the animist traditions and Christian religious practices. Significantly, we draw from institutional bricolage understanding about the ways in which these adapted and hybridised forms of governance are invested with authority and made to seem like the right way of doing things.

In the Rufaro irrigation scheme bylaws[28] are established to guide how they deal with the members who are in debt to the irrigation scheme. Specifically, the bylaws state that 'all the members who are in debt to the cooperative should be relieved of their membership to the cooperative and the irrigation scheme'.[29] However, in practice, irrigators with debts to the irrigation scheme are not expelled; they are only denied access to water for irrigation till they have settled their debts. The logic behind the variance between the bylaw and practice is the rationality that labour and time invested over a long time cannot be undone by a momentary failure to pay a debt. The chairperson of the irrigation scheme explained this as follows: 'we cannot continue expelling members as we did in the earlier years of this cooperative. People have laboured and invested in the cooperative through the difficult years and it is only sensible to protect the people, some who are now old and some who are the children of the pioneers of this cooperative. This is their inheritance, and it is morally wrong to disenfranchise anyone of their inheritance because of a debt'.[30]

The reference to physical labour as an investment in the infrastructure and the cooperative during the difficult years – particularly from 1985 to 1995 when the farmers worked as employees of the cooperative with little income in return – is used as a fundamental moral principle of reciprocity. However, historical records show that other founding members were previously expelled from the cooperative and/or were made to pay debts with interest, depending on their relations with the committee. Our data also shows that the principle not to provide water to irrigators with outstanding debts is renegotiated by calling on support from God through prayers. At a meeting to announce which members would be denied water because they were still in debt for electricity, an old widow – who was among the defaulters – volunteered to offer the opening prayer. She spoke the following words:

> God of heaven and earth, protector of widows and orphans, the One who does not choose the rich over the poor, help us in this irrigation scheme because that is where we draw our livelihoods.[31]

It is noteworthy that the widow used her agency of offering the opening prayer and actively referring to God. After the prayer, the vice-chairperson, who is also a local church pastor, requested

members to allow those with outstanding bills to irrigate despite the agreements they made earlier. He started his appeal with a saying in Shona that can be translated as 'even if one is poor, he or she is still a human being and cannot be buried alive'. This saying expresses that the poor people within the community should not be neglected or treated inhumanly. He continued by saying that '… we have the old and widowed who look up to us for protection'[32]. The proposal of not denying the defaulters access to water was met with a little resistance from a few irrigators but was accepted by most irrigators. This suggests that the reference to the community's responsibility to care for the disadvantaged is a moral rationality shared by many. However, there is an authoritative meaning to this moral rationality because there is an aspect of control through the two-tier authority of the vice-chairperson of the cooperative, who is also a church leader. The position of the chairperson is hybridised – partly based on the ecumenical authority and partly on the authority of the chairmanship. Thus, the fate of those in arrears is decided with the influence of the two positions held by the vice-chairperson of the irrigation scheme. The seamless overlap of the authority of the vice-chairperson is apparent given that some irrigators are part of his congregation. He will not easily be opposed, especially not by those who belong to his congregation. It is interesting to note that the vice-chairperson himself did not actively refer to God, but rather drew on aphorisms common in Shona beliefs.

This corroborates with the interview quote with which we started this article. That quote suggests that leaders are chosen not on their merit to lead and uphold the values enshrined in the bylaws but those who care and uphold other moral rationalities which glue the community together. However, this rationality of caring for the less fortunate community members comes with costs for other members and is therefore also questioned. One farmer who did not have any debts to the irrigation scheme, stated: 'we understand their financial situation, but we are equal irrigators in this irrigation, each with one share [in the cooperative] and for how long will this continue? It is painful, but we cannot always accommodate such members'[33]. Thus, this suggests that there is emotional labour that goes into working and relating well in the Rufaro Irrigation Scheme.

Conclusions

In this article, we have brought the concepts of institutional bricolage, moral ecological rationalities and care into engagement with each other to offer insights into management arrangements in an irrigation scheme. Through our empirical data we have shown the constant processes of bricolage through which irrigators dynamically enact everyday irrigation challenges and make sense of changing circumstances by referring to different, often hybrid moral-ecological rationalities (see also Cleaver et al., 2021). In this, we have deliberately foregrounded narratives that show how these rationalities are often also imbued by more caring and intimate ways of understanding people-environment relations, including those that refer to spiritual understandings of life. We do so not to romanticise these but to show how they also matter in addition to – or mixed with – control-for-profit motives that are more commonly highlighted in water studies.

With this we plea for more detailed, empirical analysis of how different practices and rationalities blend together in everyday life to get more accurate insight in what it actually takes to make water flow in an irrigation scheme. This importantly includes less visible, often unrecognised, yet labour-intensive maintenance activities such as – in this case – the cleaning of the storage tank and the unclogging of the pipes. Without these investments the irrigation scheme will not function, yet for those involved in these activities, their actions cannot be explained by simple economic logics of costs and benefits, nor of increased social standing. Rather, our empirical data shows how the irrigators relate their involvement in such physical demanding tasks – at least partly – to paying tribute to their ancestors. Studying what actually motivates people to act and how they make sense of what happens to and around them, can inform more accurate, modest ways of explaining collective action in irrigated agriculture. In the process, it illuminates a nuanced understanding of structure and

agency dynamics in everyday interactions that moves beyond binaries such as traditional/modern, resistance/domination, society/nature and life/death.

Yet, perhaps more importantly, our aim to foreground different rationalities is also essentially a political one. It comes from a recognition that predominant conceptual terminologies in literature are not 'universal' or 'neutral' (Singh, 2017; Zwarteveen et al., 2021). The emphasis on controlling water – for efficiency reasons and ultimately economic gain – can be traced back to distinct political projects of imperialism (Archidiacono et al., forthcoming; Domínguez Guzmán et al., 2017; Vera Delgado and Zwarteveen, 2007). Portraying water as something that needs to – and can – be controlled, and diminishing engagements with water to aims of subordination, thus served – and still serves – particular agendas and interests at the expense of other value systems (Water, 2021). Yet, this also means these logics are not self-evident or immutable. By foregrounding other ways of understanding people-environment relations, we hope to create political and conceptual space to challenge and destabilise these predominant representations in water studies, especially because they are recursively linked with water development interventions (see also Zwarteveen et al., 2017). We thus purposely emphasise how people draw from various logics and bring in moral ecological rationalities – including spiritual understandings – to make sense of the world around them and enact irrigation management. We show how people care – for crops, for aquifers, for ancestors, for each other – through their everyday engagements with water and infrastructure, in the hope to nurture and build on these practices. Hopefully, our approach might inform and inspire other research studies to engage with the concepts we deploy as a way of understanding people's understandings, motivations and practices of collective action. Such insights into the everyday dynamics of irrigation schemes might usefully inform (policy) interventions in irrigation schemes. With this, we do not claim that a revolution is on the way, yet we hope that accounts like these may inspire and encourage other ways of sharing and caring for water and imagining more just and sustainable futures. After all, through subtle, yet crucial changes transformations can also be achieved.

Highlights

- Institutional bricolage, moral ecological rationalities and care explain management and engagements in a smallholder irrigation scheme.
- Motivations to care (for people, the environment and infrastructure) as well as to control, shape the bricolaged management arrangements.
- This paper furthers the ambition to create political and conceptual space to challenge and destabilize predominant representations in water studies.
- This approach helps to understand the possibilities of caring for natural resources and imagining more just and sustainable futures.

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Notes

1. In the local language the term 'hunhu' is used for humanism, and according to Samkange and Samkange (1980) hunhu(ism) is 'the attention one human being gives to another: the kindness, courtesy, consideration and friendliness in the relationship between people, a code of behaviour, an attitude to others and to life'.
2. Alias for the secretary of Rufaro Irrigation Scheme.
3. For a schematic characterisation of the political, cultural and sociological roots of institutional bricolage thinking, see Cleaver and Whaley (2018) Understanding process, power and meaning in adaptive governance: A critical institutional reading. *Ecology and Society.*
4. By mainstream, we do not refer to a single category of literature but a wide spectrum of prevalent research which covers different aspects of irrigation including economic and social performance, technical performance and management. These are the dominantly researched areas in irrigation and are often conducted using quantitative methods and often presented as a measure of performance hence efficiency.
5. By contemporary we mean it is hybrid – rooted in Shona culture but adapted and blended with other elements of the contemporary worlds – Christianity, capitalism, science, development, etc.
6. Totems are enduring animal symbols with spiritual significance to a family, clan or tribe, in general and they have the ability to connect and identify a group of people to the same spiritual realm or origins in particular Steiger B (2008) *Totems: The transformative power of your animal totem.* UK: Harper Collins Publishers.
7. F17, Interview with farmer number 17 carried out at Rufaro irrigation scheme in 2020.
8. F1.
9. F8.
10. F17.
11. F17.
12. F17.
13. F1.
14. GE1.
15. F22.
16. F1.
17. F27.
18. F8, F19, F3.
19. F29.
20. To the Shona traditional religion, Mwari is the Supreme Creator deity, the creator of all things and all life and all is in him.
21. F17.
22. F17.
23. F17.
24. F35.
25. F29.
26. F29.
27. F27, F9, F18.
28. The bylaws are guidelines which were developed by the Ministry of Women Affairs, Community, Small and Medium Enterprise Development in consultation with the Rufaro Irrigation Scheme. These bylaws stipulates among other things how the irrigation is managed and give rules and laws of how members

of the irrigation scheme conduct themselves as well as the punitive consequences of not following the rules. These bylaws are enforced by the seven member committee. However, as shown they are in practice used together with other rationales/hybridised.

29. F26.
30. F17.
31. F16.
32. F25.
33. F8.

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