


Institutions influencing plot access and intergenerational land transfer: Policy insights from a smallholder irrigation scheme in Zimbabwe[☆]

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ABSTRACT

Land access is a challenge for young farmers in Africa and likely to become increasingly so, with institutions and intergenerational dynamics a critical influence. Access for existing and would-be young farmers is vital to ensure an age-diverse farming population and support generational renewal on smallholder irrigation schemes. This research adds to the literature on formal and informal institutions impacting plot access and households' perspectives on farm transfer, using a smallholder irrigation scheme in Zimbabwe as a case study site. Qualitative data from interviews with young people, parents and practitioners were analysed by applying the Institutional Analysis and Development framework. The findings firstly illustrate the hybridised and multi-level nature of plot access arrangements, including the flexible leasing arrangements engaged in by young farmers. The data supports the generation of testable hypotheses and theorisation that plot transfer is a staged process, highlighting parents' dilemma of balancing their own and their children's needs and reflecting both inability and reluctance to transfer control. Suggestions for policy and development and further research are highlighted in the conclusion, including the need for schemes to have a strong focus on stimulating rural development, cross-generational approaches to support ongoing land access for young farmers and further research.

1. Introduction

The inequities arising from land being concentrated in the hands of a few is an age old, global debate (Ochieng, 2020). Ideally, land "should contribute to economic growth and promote equitable and sustainable livelihoods for all" (Chitonge and Mine, 2020, p. 199). Land is also beneficial in non-economic ways, supporting a family's well-being, and providing social status and a form of insurance (Pritchard et al., 2017). While farming may not be the aspiration for all, the majority of young people in rural sub-Saharan Africa (SSA) have livelihoods that encompass some farming (Sumberg et al., 2024). Land access is a critical challenge for young farmers that is expected to become more difficult, and is exacerbated by economic crises for Zimbabwe's youth (Chamberlin et al., 2021; Chipato et al., 2020; White, 2020).

Equitable land access is far from simple in practice. Access and use

are governed by institutions, which mediate social interactions through formal and informal laws, community norms and family rules (Ostrom, 2015). Patriarchal and gerontocratic institutions create particular generational challenges, with elders controlling farming labour and land access and thereby influencing young people's livelihoods (Sumberg et al., 2024; White, 2020). While institutional change can be a significant place to intervene in systems, powerful interests may resist and change can be protracted (Hounkonnou et al., 2012; Maru et al., 2018; Ostrom, 2015).

Typical dryland and irrigation land access routes for young people in Zimbabwe includes inheriting or sharing parents' land, and renting or buying (Parry, 2024; Scoones et al., 2019). However, it can take from five to seven years to save to rent or buy (Parry et al., 2022), with older farmers typically having access to larger areas (Chamberlin et al., 2021). Young women are less likely to inherit land, and access is significantly

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more challenging for those with landless parents (Parry et al., 2022; Scoones et al., 2019; Tadele and Gella, 2014). Hence, rental arrangements in the informal economy are particularly common in southern Africa, though insecure rights and unequal power relations create barriers for young people (Chipenda and Tom, 2020; Marewo, 2024). Additional concerns include: insufficient assets for inputs; inheritance dynamics that delay entry into farming or stimulate relocation; subdivision decreasing plot sizes; and commodification and increased demand for land (Chamberlin et al., 2021; Jayne et al., 2021; Kosec et al., 2017; Parry et al., 2022; Scoones et al., 2019; White, 2012).

Land reform is an “inherently political process” (Ochieng, 2020, p. 15), with broad scale approaches typically involving titling or redistribution (Lawry et al., 2023). Learning, experimentation and participatory approaches are needed to ensure reform contributes to sustainable development (Chitonge and Mine, 2020; Ochieng, 2020). Participatory and multi-level stakeholder learning and problem solving processes on smallholder schemes in Zimbabwe and other southern African countries have supported institutional change and been effective at bringing un- or underutilised land into production and increasing plot access for young farmers (Bjornlund et al., forthcoming; van Rooyen et al., 2020; Mdemu et al., 2020; Moyo et al., 2020; Tafula et al., 2024).

While there is emerging research on farm succession in resettlement areas in Zimbabwe, under the Fast track Land Reform Programme, there is limited literature on transfer on smallholder schemes (Chipato et al., 2020; Chipenda and Tom, 2020; Maunganidze and Dzingirai, 2021; Scoones et al., 2019). In the context of Silalatshani smallholder irrigation scheme in Zimbabwe, this paper responds to this gap by addressing the question: how do scheme- and household-level institutions enable or constrain young people’s plot access? The contribution is an increased understanding of the formal and informal institutions influencing leasing arrangements and parents’ decision-making about plot access and transfer, and identifying implications for policy. The research conceives smallholder irrigation schemes as complex systems where a myriad of biophysical and socio-economic factors influence decisions and action. The research uses a novel application of the Institutional Analysis and Development framework (IADF), which is suited to exploring macro to micro institutional influences in complex systems and supports middle range theorising. The paper, therefore, also makes a contribution to the use of the IADF for theory generation relating to plot transfer and succession.

The paper is structured into: literature on land access institutions and intergenerational transfer; the research approach, including application of the IADF and action situations; findings in regard to scheme and parents’ decision-making as part of household-level institutions for plot access and transfer; a discussion of findings and linkage to the IADF; and insights on further research to enhance policy and development in the conclusion, including testable hypotheses.

2. Land access institutions and intergenerational transfer

In pre-colonial Africa, inheritance and succession were underpinned by patrilineal and matrilineal principles, with a strong correlation between transfer and kinship systems and distribution at key family development stages (birth, marriage and death) (Ishor et al., 2013). Colonialism strengthened patriarchy and complicated inheritance processes, with land access decisions becoming a dynamic blend of state institutions, customary norms and Christian beliefs (Chitata et al., 2022; Ishor et al., 2013; Moyo et al., 2022; Siziba and Wood, 2015).

Relevant key state institutions in Zimbabwe include the Communal Lands Act of 1981, which outlines that Rural District Councils (RDCs) should allocate land to families that customarily live in an area and for this to be based on customary laws (Bhatasara, 2019). The 2013 Constitution also grants land administration powers to traditional authorities in communal areas, though the powers may be uncertain where the state has an interest (Lawry et al., 2023). In theory, equitable access for youth and women is provided through the Constitution; however,

government officials have limited appreciation of the provisions, there is weak enforcement, and the statutes are poorly aligned with laws such as the Communal Lands Act (Bhatasara, 2019; Chipato et al., 2020; Lawry et al., 2023). Statutory Instrument 53, dealing with permit terms and conditions for agricultural land settlement, is a further land access mechanism for women that are joint permit holders, which ensures their rights when they divorce or their spouse dies; however, this only applies in new resettlement areas and guidelines are open to varying interpretation (Bhatasara, 2019; Vhiriri, 2021). While the legal instruments support inclusivity, customary practices, such as male headship, privilege males in their control of land (Bhatasara, 2019; Lawry et al., 2023). In their study of young Zimbabwean’s struggle for land, Chipato et al. (2020) affirm the dominance of men and patriarchal norms in local land allocation methods, and add political affiliations, patronage and decisions by traditional authorities as additional potentially divisive institutional influences. The plurality of governance systems can make regulation complex (Chitonge and Mine, 2020); however, where there is interconnection and complementarity between formal and informal institutions there will be benefits such as reduced transaction costs and improved institutional performance (Pagan, 2009). On irrigation schemes, hybrid land arrangements can extend to leasing, with subletting or subdivision of plots, to share with family members or others, possible alongside fixed scheme membership (Chitata et al., 2022).

Intergenerational land transfer arrangements and a family’s decision-making dynamics sit in this broad institutional context. In Africa, young people are ‘deeply embedded’ in family and social networks and generational dynamics are imbued with unequal power relations; it is ultimately the older generation who decides whether land transfer happens or not (Conway et al., 2019; Flynn and Sumberg, 2018; White, 2020). While they await land allocation or access, many youth relocate elsewhere for work (Mdemu et al., 2023). Parents that assist with access can help start the accumulation process, but acquiring land independently is more of a challenge (Scoones et al., 2019).

While older generations not ready to relinquish land will sometimes help the younger generation look for alternative options (Chipato et al., 2020), there is emerging literature on succession in farming and small to medium family businesses in Africa that reflects increasing interest in succession processes and planning. This literature suggests several challenges: older generations retaining control, preferring old practices and not trusting younger generations; challenges to select a successor(s) and gender dynamics; and lack of planning, poor cohesiveness and conflict in families (AHA & GIZ, 2021; Dumbu, 2018; Maunganidze and Dzingirai, 2021; Nyoni, 2019; Scoones et al., 2019; Shumbambiri, 2023; White, 2020). While it is not stated explicitly in the African context, financial insecurity limits Thai farmers’ ability to retire (Jansuwan and Zander, 2021), and must pose challenges for older Zimbabwean smallholder farmers who form part of the self-employed and informal sector workers that do not receive social security (Nhede et al., 2023; OR&DP, 2023). As more than 90% of Zimbabweans have livelihoods in the informal economy (World Bank, 2018), financial considerations and safety net provisions are critical. Therefore, next-generation land access needs to allow for entry into as well as exit from farming (Scoones et al., 2011, 2019). Studies of older farmers and agricultural communities from developed countries highlight additional considerations: resistance to the concept of retirement; a struggle to see an alternative future; and a desire to protect the emotional and social benefits and value they derive from farming (Breitenbach et al., 2024; Conway et al., 2019, 2021). Consequently, understanding household perspectives on intergenerational farm transfer is critical to support effective succession, as a pathway into farming for young people and protection for older generations (AHA & GIZ, 2021).

3. Research approach

Institutional analysis frameworks play an important role in diagnosing and understanding the dynamics of social-ecological systems,

including identifying potentialities as well as problems (de Vos et al., 2021; Ostrom, 2007). Section 3.1 describes the Institutional Analysis and Development framework (IADF), which is suited to exploring contemporary and historical institutions. The IADF is also suited to case study and qualitative approaches, with these aspects of the research approach explained in sections 3.2 and 3.3.

3.1. Research framework: IADF

The IADF (Fig. 1) has been used to analyse the institutions facilitating social interactions in diverse policy settings: for example, household collective action in natural resources management (Doss and Meinzen-Dick, 2015); farmers’ land use conservation decision-making in response to changing policy (Duangjai et al., 2015); smallholder inclusion in markets (Mwema and Crewett, 2019); or comparative analysis of water reform and food systems (Blekking et al., 2017; McCord et al., 2017). A key part of case studies using the IADF is to identify formal and informal institutions impacting decisions, which actors are involved and how both institutions and actors influence outcomes (Schlager et al., 2022). The framework is suited to exploring macro to micro level influences on decision-making and serves as a ‘checklist’ and prompt for analysing institutional influences. Importantly, institutional analysis is concerned with potentialities as well as problems (Ostrom, 2007), which equates, in this research, to identifying what enables or constrains plot access for young farmers. The IADF has been described as ‘meta-theoretical’; that is, the framework is theory-neutral in its application but allows researchers to test or build theories of interest (McGinnis, 2011, 2016; Ostrom, 2011).

In this research, particular focus is placed on the action situation, which represents the interdependent actions between two or more actors managing a social dilemma (Schlager et al., 2022). These decision-making spaces are influenced by a set of exogenous variables: resource or biophysical conditions, attributes of a community and institutional arrangements (McGinnis, 2011, 2016). In an action situation, actors with their own preferences are making choices by drawing on their resources (relevant to the decision) and the information they have to hand, and in accordance with decision-making rules and informal institutions (Doss and Meinzen-Dick, 2015; McGinnis, 2011). Social bargaining is influenced by these factors and the relational ties inherent in interactions. Finally, the dynamics of an action situation produce patterns of interaction and outcomes, which are evaluated and provide feedback for future choices and decision-making.

In this research, the action situation represents a space where parents make decisions about land access for younger members of their household, with state, scheme and other households’ land access rules (i.e. leasing arrangements) being exogenous to the action situation. This paper presents findings concerning scheme institutions and households’ leasing rules (section 4.1) and parents’ decision-making (section 4.2),

and synthesises the findings with respect to the IADF in the discussions (Figs. 3 and 4). The application of the IADF to explore decision-making about plot access and transfer on smallholder irrigation schemes constitutes a novel use of the framework. Rather than testing any specific existing theories, the theory explored is around the interactions between the IADF’s components and the enabling or constraining role of institutions. In so doing, the framework supports theory-building. An interesting advantage of the framework is how the influencing factors can be visualised as a way to communicate findings.

3.2. Study area

The case study site was the Landela Block on Silalatshani irrigation scheme, which is located in the Insiza Rural District in Matabeleland South Province (Fig. 2). Smallholder irrigation schemes were created pre-independence as a means to curb rural–urban migration, with stipulations for farmers to grow prescribed crops to support food security (Zawe et al., 2015). It was common for smallholder schemes to be established in areas with low productivity, and Silalatshani lies in a drought-prone area in Natural Region IV (Moyo et al., 2017; Zawe et al., 2015). The scheme is supplied by a dam, has a potential irrigable area of 442 ha across five blocks, with the 845 plots averaging 0.41 ha (Moyo et al., 2017). When the scheme was established in the late 1960s, irrigators were given leases from the Office of the District Commissioner that permitted them to irrigate subject to continuing good performance (Mutizira et al., 2019). In earlier times, the scheme was managed by a single manager and supported by government Agricultural Extension (AGRITEX) officers (Mutizira et al., 2019), but is now jointly-managed by the government and the Irrigation Management Committee (IMC) who administer a set of by-laws (Appendix 1). These by-laws include the need for plots to be used productively but make no mention of plot handover.

The land at Silalatshani is state-owned and use is allocated by the RDC through the Communal Land Act (1982); however, it appears irrigation plots can be “transferred generationally through marriage” (Moyo et al., 2017, p. 742). Household heads are the registered plot holders, with approximately three-quarters born in the local area in 2014 (Moyo et al., 2015). The majority are male (79%) and aged over 40 (84%) (Parry et al., 2024). Scheme membership is predominantly drawn from households within Wards 3 and 11, which fall under Chief Sibasa (Mutizira et al., 2019). As these wards comprised 6459 people aged under 40 in 2012 from a total population of 7973 (using ZimStat (2012) for population and City Population (2021) for proportions under 40), it is clear there are insufficient plots for most young people to enter scheme irrigation.

Households engaged in scheme irrigation also undertake dryland farming, livestock keeping, and non-farm activities (locally or elsewhere), and most young people are similarly engaged in a mix of farm

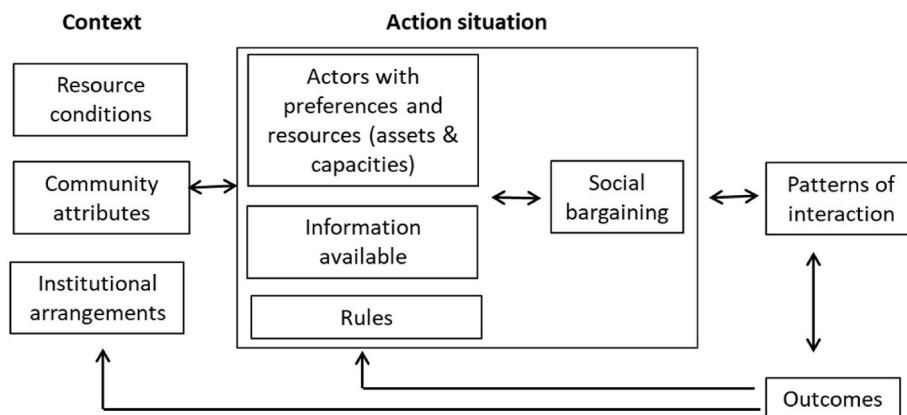


Fig. 1. Key components of the IADF (adapted from McGinnis, 2011, 2016; Doss and Meinzen-Dick, 2015).

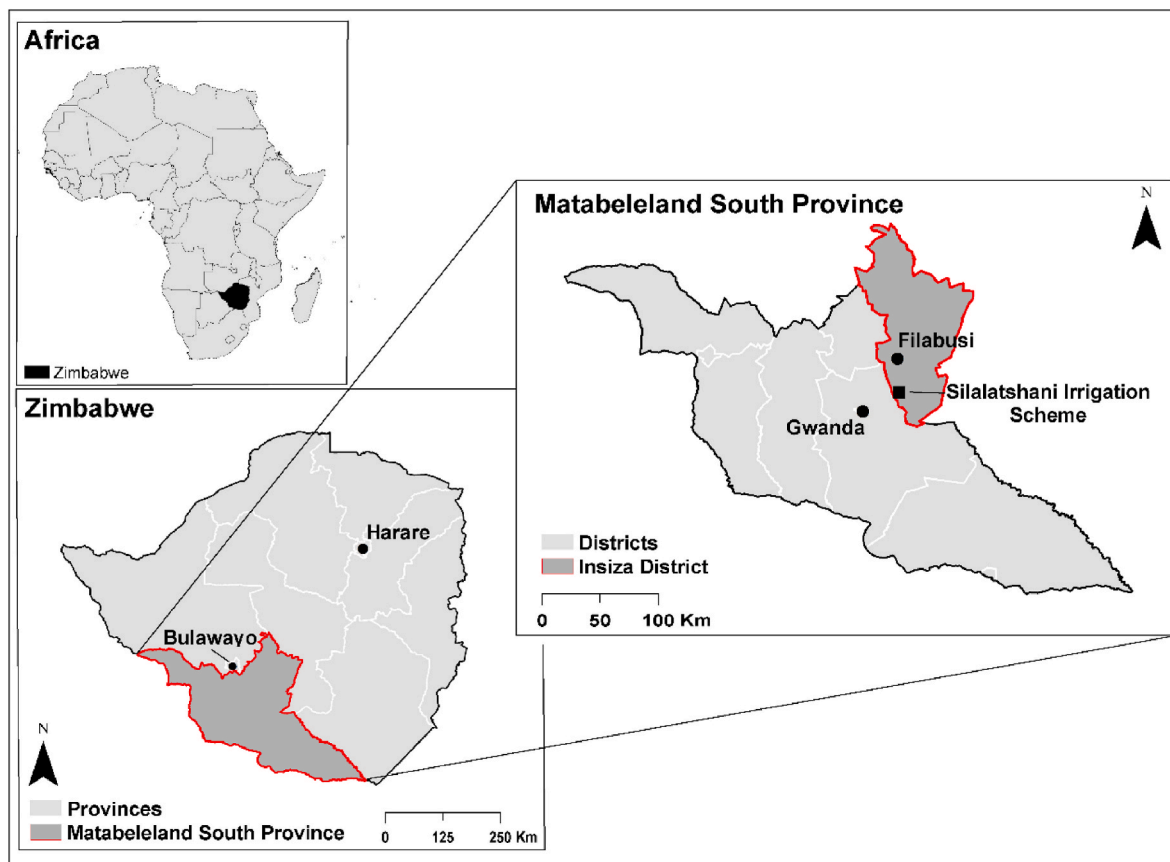


Fig. 2. Location of Silalatshani Irrigation Scheme (Source: GADM data underpins the map, <https://gadm.org/>).

and non-farm work. Scheme irrigation is an important income-generating activity for the young farmers that can undertake own-account farming, though it appears the majority working on plots are engaged as labourers (Parry, 2024). Many relocate for work and gold mining is a particular activity that pulls young people away from the scheme.

Like many smallholder schemes, Silalatshani has experienced significant challenges, including an ineffective IMC, water shortages, production of low-value crops, and weak connection to markets (Moyo et al., 2017, 2020; van Rooyen et al., 2020). One outcome of these challenges has been under-utilisation of irrigation plots—with potentially 80% of the irrigable land under-utilised in 2014—with most plots brought back into production during the ‘Transforming irrigation in southern Africa’ (TISA) project (Moyo et al., 2017; Quirke, 2019). The TISA project introduced soil monitoring tools and Agricultural Innovation Platforms to identify locally-appropriate solutions to overcome barriers to profitability. These and subsequent interventions stimulated a range of changes that improved plot usage: for example, improved irrigation management and crop yields; and the ability to grow and access markets for higher value crops (for more detail on TISA see three Special Issues of the International Journal for Water Resources Development: volume 32(5), 2017; volume 36(S1), 2020; and forthcoming). Further, the issue of absentee landowners was raised at an AIP meeting as a specific barrier to scheme productivity. As a result, a land audit was conducted with the RDC’s involvement, which showed vacant land was linked to absentee plot holders and with unused plots then reallocated for use by people living on the scheme (Parry et al., 2020).

3.3. Data collection and analysis

Case study research using qualitative data is a useful approach to gain in-depth insights on complex social phenomena (Creswell and

Plano Clark, 2018; Yin, 2018). Case studies using the IADF typically span multi-level institutions and have several units of analysis (Schlager et al., 2022). Hence, data was collected in 2019 (July to September) through semi-structured interviews with parents (13 interviewees, including 5 females), practitioners (11 interviewees, including 2 females) and young people (30 interviewees, including 14 females) (see Appendix B for all interviewees) to gain insights from multiple perspectives about the formal but mostly informal institutions associated with plot access.

Drawing on TISA household survey data and scheme AGRTIEX officers’ local knowledge, parents were purposefully selected to represent a mix of incomes, marital status and household size and also to gain perspectives from scheme and non-scheme households. In the interviews, parents were asked open-ended questions about how they involved and motivated their children in farming, how plot usage by their older children was managed, and their processes and challenges related to plot succession. Data presented in the findings is attributed to parents using the notation PSc1-8 (scheme households) and PN-Sc1-5 (non-scheme households). Interviews with practitioners were tailored to their leadership or development role related to the scheme, and they are denoted by Prac1-15 in the findings. Broadly, they were asked about young farmers, their plot access arrangements and whether these were effective or not. Young people aged 18–40¹ were also selected for interview, with purposeful and snowball sampling to identify a diverse range of young people in terms of age, marital status, livelihood activities, from scheme and non-scheme households and living around the scheme or elsewhere. All were asked about their farming experiences

¹ While youth are typically identified as being 15–35 in policy documents (e.g. MYIEE, 2013), a higher age range was deemed appropriate as young farmers often inherit land later in life (White, 2015).

when they were growing up and, for those who had become engaged in farming, how they accessed plots and the influences on their choices. In all interviews, probing questions were used to elicit more in-depth insights.

A small number of practitioner interviews were undertaken in English, while the majority were undertaken in SiNdebele. Interviews were recorded, transcribed and translated into English, and the data managed using Nvivo software. After preliminary analysis of the transcripts, the data related to plot access (phrases or paragraphs) were pragmatically and descriptively coded to organise the data into scheme institutions, leasing arrangements and parents' decisions about plot use and succession (with a sub-coding for gendered decisions). Institutions and actors associated with plot access decisions were then synthesised from the data, with the analysis encompassing repeated reading of the data (during 2019–2020), re-examining relevant literature and use of the IADF as a 'checklist' of influences and building diagrams to visualise the interactions. Theory building was not an original intent; however, the analysis has supported middle-range theorising—something which social-ecological systems researchers are just starting to explore (de Vos et al., 2021)—around stages of plot transfer and enables us to suggest testable hypotheses for future research.

4. Results

4.1. Scheme institutions and leasing arrangements

While the emphasis of this paper is on parents' decisions about plot access for younger household members, scheme-level institutions are important contextual influences on young people's plot access. This includes a rule that scheme members should be drawn from Wards 3 and 11. An AGRITEX officer believed this rule should be more open: *"If someone from somewhere else sees an opportunity here we should be able to allow them to use that scheme as long as they are in our district or nearby districts"* (Prac7). This related to a concern over the number of young farmers. Two senior AGRITEX officers in a joint interview said that policy for new irrigation schemes allowed for membership to include a proportion of disadvantaged groups, including youth (Pracs3&4). While selection had previously been prioritised for married youth, they advised that age, distance from the scheme and availability of family support were now key considerations. Silalatshani's IMC also kept an applicant list to coordinate the redistribution of plots relinquished by plot holders. A scheme leader suggested that youth were prioritised on this list (Prac6).

Parents were aware of the blended institutions that influence plot access:

As you see, the law says if I die then someone on the applicant list can get the plot and yet Mthandazo [my son] is there and has children. It meant this plot [could] never be regained by the family ... as people of Sibasa we saw that this was not fair for people from as far as Matobo District to gain the land in our area while a Sibasa-born has nothing. As such we decided that it is in our best interest to hand over the plots to someone in the family ... But [now] if there is a family member that will opt to take-over then the plot becomes a family inheritance, even though it's not (PSc1).

Hence, the land remains state owned (law), but a plot can be passed to the next generation (local informal rule); thus, appearing as though plots are 'owned' and 'inherited'. The 'people of Sibasa' are the families who lived on the land before the scheme was built. Follow-up questions with another interviewee suggested *'we decided'* refers to a previous Chair of the IMC negotiating this informal arrangement (Prac5). It was not clear when the hybrid arrangement came into being. Plot owners are, therefore, aware and accept the existence of both a formal and informal rule relating to plot handover; thus, giving both institutions legitimacy. The hybrid arrangement appears to work in practice, and there was no indication that it was formally written down and it does not appear in the by-laws. As the informal generational rule preferences

families with registered plots, it would be interesting to know more about whether it is more widely accepted.

While some young farmers started farming on a parent's plot (see more section 4.2), practitioners advised that most young farmers had little choice other than to lease: *"... they don't have an option at times. Because if you do want land ... that's the only way to go"* (Prac7); *"for youths who have no plot, it's not easy for them to get one ... they can only be rented from those who have children outside the country or whose children are lazy to work"* (Prac13). Leasing arrangements were also made with farmers no longer interested in using their land or older farmers no longer able to farm (Appendix C). These arrangements help plot holders abide by the productivity by-laws (Appendix 1).

Social relations are an integral part of leasing, and both young farmers and plot holders approached the scheme or section committees or AGRITEX officers for assistance in either finding a plot or someone to lease to. Other young farmers liaised with the Chief, with parental assistance, to demonstrate their permanency and identify unused plots and their history. The prospective leasee sought to ensure the plot had the potential to be productive, and the plot holder wanted to ensure a leasee would work hard, farm productively and not create problems. Hence, plot holders may seek out successful young farmers rather than new entrants (Appendix C).

AGRITEX maintained a register of plot holders and associated plot numbers (Prac7). Leasing arrangements required the involvement of the section committee, and were recorded in this register. The section committee and AGRITEX then advised the leasee of scheme duties and expectations, and ensured plot fees were attributed accordingly for whole or part use of plots. Plot fee payments for shared plots were flexible: some paid separately, and others shared the payment. The payment for leasing a plot was a barter arrangement rather than a cash transaction, such as part of the harvest or ploughing services. Young labourers also negotiated to use part of a plot to grow their own food: *"The small portions I cultivate are for consumption only"* (Y9). All these arrangements are a *"mutual understanding"* (Prac7) rather than formal agreements.

Leasing was temporary and ceased, for example, when a plot holder's children returned or the plot holder resumed farming. Plot holders should give a leasee a leave notice to advise when they wanted the plot back. While leasing arrangements appeared mostly mutually beneficial, interviewees advised that some plot holders mischievously used the arrangement to have their overgrown plots returned to a productive state, creating challenges for the leasee.

4.2. Parents' decision-making for plot access and transfer

At least three stages of interaction with family plots were identified: i) engagement in childhood and pre-handover; ii) hand over of plots in adulthood; and iii) eventual transfer of a plot. The findings on these stages are presented separately, as well as parents' rules relating to plot handover to female children.

4.2.1. Engagement in childhood and pre-handover

It was common knowledge and a working rule among families that children must be involved in farming at an early age—*"They are supposed to assist"* (PSc2); and *"They saw the life of other children who helped their parents at the plots so they also knew that they should help out"* (PSc8)—and children helped with ploughing, planting, fertilising, weeding and managing pests, harvesting, transporting and selling crops, and caring for livestock (Appendix D). Farming activities were often managed around school; however, some children were removed from school to assist with farm work: *"At times they would make/force us to miss school saying we needed to help in the fields"* (Y28). The nature of children's engagement differed between families:

- Willing: *"When you go to the fields without being pushed and willingly, you get to enjoy the work"* (Y14); while initially forced, one young man

said that he came to see “*that this is our source of livelihood so I will end up pushing myself to assist*” (Y7).

- Coercive engagement: “*They used to encourage us through beating us*” (Y28); or “*they used to lock all the doors at home and cook in the fields. So, if you decide not to go you would starve the whole day*” (Y8); “*They talked harshly to us and you know when you are a child that when a parent shouts and speaks like that it’s a must to do it*” (Y23).

Parents suggested that teaching about farming was easier when children were young as “*teaching them is difficult once they are adults*” (PN-Sc3). This was assisted by giving a child a small garden to farm for themselves as encouragement: “*this garden is yours child. ... so they are motivated ... and boasting that it is their work*” (PSc2); and the ‘*spirit of ownership*’ then motivated engagement (Y15). Others reported “*they did not give me a piece of land to cultivate on my own*” (Y9) when they were young, with another suggesting that parents don’t always recognise when their children can do things on their own and this drives them away from farming (Y15).

There were several purposes and long-term benefits from this early engagement of children: earning some money for themselves; learning how you can save money through farming; learning farming skills and knowledge so they can farm and take care of themselves; recognising the need to work hard; and acquiring the motivation and mindset for farming in the future (Appendix D). While return on investment influences interest or motivation, the hard work associated with irrigation may be a deterrent for later engagement:

Irrigation is the type of farming that needs you to grow up in it ... [as] it’s not easy for them to get involved in it if they were never exposed to it from when they were young (PSc8).

These children see how hard their parents are working and they don’t want to get involved in these activities. They will just not come to the scheme (Prac7).

One scheme leader commented on exposing children to the value of farming: “*When I go and sell my produce I bring money at home. I don’t hide anything from them so that they understand the value of farming*” (Prac13). For a successful young farmer, his motivation also stemmed from watching his parents and seeing that “*there’s nothing else that can sustain me in life other than farming*”. This quote illustrates the distinction between parents farming for subsistence versus those farming as a business with the latter more motivating for young children.

4.2.2. Hand over of use-rights in adulthood

Early engagement as a child eventually transitions to engagement in adulthood. When parents’ children remain locally, they may have been given a larger portion of land to farm as they became an adult. Traditionally, marriage was the time that young people would be given land, either a portion of their parents land or land allocated by the traditional leader (Prac3). Hand over linked to marriage was still practised in some families:

We gave them [irrigation] land about five years ago. ... When they married that’s when we decided that they needed larger pieces of land and we gave them more on top of the small pieces of land so that they can fend for themselves. ” [If they were not yet married], they would still be using those small gardens we gave them when they were young so that when they are not around we can easily work in their gardens. But when they are married you are guaranteed that, even though they may not be around to work, the wife will be there to manage (PSc8).

This illustrates the transition from a small garden to a larger area to sustain a young family, fostering their independence and family relations. However, parents also handed over portions of their irrigation plot to help their single children become established in irrigation: “*They gave me a portion of land in their irrigation plot and with time I looked for my*

own plot” (Y13). When the adult children used a family plot, the hand-over arrangement was “*a family agreement*” (PSc4) and the parents remained as plot holders on the register: “*There’s no need for name change if the person to take over the plot is my child*” (PSc4); and “*They [parents] surrendered them to me. There is only a change of management that has taken place*” (Y15). Hence, these arrangements were not recorded by AGRITEX in the plot register. The young farmers are expected to pay the water fees as well as the maintenance fees as plot users, which amount to approximately US\$14/ha/month (M. Moyo, personal communication, 18/12/24). They may also contribute to scheme maintenance; however, households’ labour arrangements for scheme maintenance were not explored in the interviews.

These are examples where plots were freely shared with children, and it was suggested this handover was easier with more literate farmers (Prac7). There are several generations among the farmers on the scheme, and it was not clear whether the age of a parent or grandparent was related to their ability to freely hand over plots to children. However, there was a general perception that older farmers—and it is speculated this is the oldest generation—were less likely to freely hand over their plots as they preferred to retain control:

Some adults don’t see that their children have now grown and that they can do things on their own ... [young people] lose interest and leave the scheme because they did not see or enjoy the benefits of farming there (Y15).

It doesn’t happen most frequently. Like I said before, it’s not easy for these older guys to hand over their plot ... they want to stay in control of the decision making (Prac7).

You will find that including the youth in irrigation schemes has been a challenge because the adults are not opening up for them (Pracs1&2).

This stems from older farmers’ connection to their ancestral lands, with some fearful that the property will be misused or children will plan their demise (Appendix E). Handover is ultimately an informal family arrangement and conditions may be attached and rules may change. There was an expectation that parents would be supported: “*I will let the boys use it, but let them know that when they harvest they should remember me*” (PSc5). Problems arose when parents changed the arrangement and leased the land to others, which was because they needed some income and/or their children were not using it productively:

The parent can decide to give that land to another person to use whilst you are still using that land (Prac5).

Because they will be needing rental benefits. If it’s your child on the plot she or he can decide not to pay you anything. At times parents would have assessed that their child will not be very productive (PN-Sc5).

In some cases, there is no real hand over and the family arrangement is more about the provision of labour or income earning for the family:

Those [young farmers] who own plots profit more than those maybe that are farming on the parent’s plots because they might have to share their produce and income (Prac12).

The main problem is that they are farming on family plots and doing it for family consumption. Even if they farm to sell, the profit that is made is not for them but for elders (Prac13).

Some young people had issues farming for the family on plots, and a scheme leader was assisting them to farm on a disused demonstration plot to give them some autonomy (Prac13). Overall, it was more motivating for young farmers to have their own plot as they “*work even harder and produce more so as to please their parents and challenge them in terms of income generation*” (Prac12).

4.2.3. Transfer of registered plot/land holder

The later stage of interaction with family land is transfer or the

change of registered plot holder, which is discussed from the perspective of scheme and non-scheme households. A parent advised that previously: “customarily there was no written law ... [and] property was given to sons” (PSc7). The reasoning behind customary succession of land to sons was that they will not leave and the land will be retained in the family:

Old people say a girl child is not home to stay ... But it's different for young men because they believe he will not ... change the household he belongs to or change [his] surname. But he will keep on passing the plot from generation to generation (Prac12).

The rationale for this prioritisation was that young women were expected to move away when they married (see section 4.2.4). There appeared to be two customary approaches for sons being handed the land: “the youngest one who is supposed to take care of the ageing parents, is the one who usually takes over the plot” (Prac4); and the “elder brother is the one who is supposed to acquire the land when the parents pass on” (Prac5). If there was a distinction between use or transfer of ownership, it was not explicit. Elsewhere in the paper we note that intergenerational contracts for children to support their parents or other elder family members are important generally. So we might speculate that both older and younger family members handed the land would be subject to family contracts such as providing food for others. The first or last born rule was recognised by young people:

I come from a big family and I'm neither first born nor last ... I will have to acquire my own land in the irrigation scheme (Y18).

My husband was given the land since he was also the last born (Y14).

In practice, the rules around choice of the successor were fluid (Appendix E). While one parent acknowledged the ‘last born’ custom, he also suggested he would select on level of interest and productivity in farming, which was echoed by other scheme and non-scheme households. Parents or grandparents also said:

Land will be shared equally among the sons;

Property is given to the eldest on the understanding that they share with their siblings, but if the property is large then each child is told what they will receive; or

Children that have failed to establish themselves independently and have stayed at home will be given a portion of land (Appendix E).

From these examples, it can be seen that parents’ choice of successor for their land was not only based on whether their children were the first or last born. Some parents also considered farming mindset and skills and their children’s needs, which was described as an unwritten rule: “a personal law on what someone wants” (PN-Sc2).

There were many additional challenges associated with choice of successor (Appendix F). Parents’ dependents may include children that have temporarily relocated as well as grandchildren or orphans whose future needs are unknown: for example, one elderly couple interviewed had eight grandchildren and two orphans in their care (PSc4). While some young people from large families accepted that inheriting land was unlikely, sibling conflict had occurred. In complex family structures—where a parent was the second spouse or they were managing land for a male relative or the household was polygamous—children from the husband’s first family were more likely to be prioritised. Plot viability was also a concern. Splitting land between many children was not always realistic and resulted in unviable plot sizes, which was particularly pertinent as irrigation plots average 0.4 ha.

The choice of successor was kept open while the parents or grandparents were still alive. While some parents assigned dryland plots at an early age (PN-Sc3), official succession of irrigation plots typically happened when the parent or grandparent died: “the plot still remains in [the] parent’s name for a long time, maybe till the parent dies and that is when the child will officialise his name on the plot” (Prac12). The family then came to the AGRITEX office with the section committee and

changed the plot holder on the register. The timing of succession was eloquently expressed:

They say in Ndebele “there is no King that crowns another King before their death”. That’s why even wills are read when the parent passes away and the children are told their shares (PN-Sc1).

However, some “selfish” parents did not nominate a successor (Appendix F), which White (2020) suggests is common. Parents were also asked whether they had a plan for succession, with one responding:

To be honest there are few that can tell you that they have that plan. I won’t lie. I have never thought about it. In life, humans are like chicks on the ground that when it’s going about its daily scratching for food, an eagle just comes and swoops it away. We also as humans are like that. That’s how God takes us. But this plan that you are asking me about, I’m realising that we should have it. But it becomes hard for me to do it for the scheme (PSc2).

Scheme leaders and AGRITEX officers made several comments alluding to older farmers retaining land for too long, not having the strength to farm, not farming all year round and compromising the productivity of plots and the scheme (Appendix F). In contrast, transfer was also delayed because of the competitiveness of “strong horses” who would push even though they were elderly.

4.2.4. Plot hand over to female children

One parent acknowledged the state laws that support a spouse inheriting a plot, which can then theoretically be handed over to either male or female children:

[In]our modern world, yes there is a law. ... Nowadays when you die and the government gives [to] your wife ... my wife takes over everything and if she dies the children are given the property whether female or male (PSc7).

An AGRITEX officer advised that: “there is no hard and fast rule that women should not own a piece of land” (Prac7), with a female farmer saying: “I inherited those plots from my parents when they passed and till today they are under my name” (PSc8). However, this seems to be rare and there “are few young women that are chosen to be successors” (Prac12). This was confirmed by a young woman living away from the scheme who expressed her expectations about receiving land as: “Yes, I’m expecting but it won’t be easy since I’m a woman. Normally land is given to a boy-child” (Y28). Ownership sometimes appeared ambiguous, and perceived as joint when it may be formally recorded differently:

- One young married woman described the scheme plot she had inherited from her grandmother as being jointly owned with her husband (Y4).
- One young male household head indicated the scheme plot was jointly owned, but when asked to clarify said: “it belongs to my wife but as the man you are the one who looks for money so we help each other” (Y1).

Even though daughters are unlikely to be the formal successor of family land, parents do support their daughters’ access in the following circumstances:

- The family has a large area of farm land: “In our culture, the person who’s given everything is the boy child even when the girl child is there. She may be given if the property is a lot” (PSc7).
- If she lives locally: “Yes, if she has the desire and qualifies to be a good shepherd and is here at home or staying locally she can take over” (PN-Sc1); and “if she’s not married, she’s a child here so they can farm freely” (PSc4).
- Daughter’s husband has challenges accessing land: “when we realise there are challenges at the son-in law’s household. Then we can give them a portion of land as a way of helping our daughter” (PSc1).

- A child’s marriage has difficulties: “there are chances of divorcing so they ought to have things of their own and stand on your own” (PSc1).

Discussions with a practitioner (Prac5) highlight another layer of subtleties associated with gendered access:

- Married daughters living locally may gain access to land if her husband has resources (e.g. draught power) that assist the family to keep working their land;
- Hand over to females is easier when families only have daughters. However, if they then marry and move away from the area they may be asked to surrender the land, as their ownership no longer benefits the family remaining in the area; and
- Where a family only has daughters, there may be uncles or male cousins that want to keep the land in the family for similar reasons to the previous point.

5. Discussion

The findings illustrate the multi-level nature of plot access arrangements on Silalatshani irrigation scheme and the mix of actors involved (Fig. 3). A hierarchy of rules govern land access: state, scheme, community customs and family practices. However, it is the family rules for succession where there is significant complexity, variability and uncertainty.

The hybrid arrangement of state ownership of plots (law) with the possibility for generational transfer (local informal rule) illustrates several things: land administration merging two levels, which is an arrangement also used in Zimbabwe’s resettlement areas (Scoones et al., 2011); an element of fairness and equity as a moral imperative (Chitata et al., 2022); and an adaptation to suit a local context that reinstates the rule of customary descent (Peters, 2020). This hybrid arrangement is known by those that have registered plots and appears to work in practice without formally being written down; thus, the law and the informal rule are both given legitimacy by plot owners. The informal

arrangement of generational handover is beneficial for young farmers who come from households with scheme plots, but less so for those from non-scheme households. While the applicant list presented an opportunity to gain plot access, its use and administration were unclear, with most young farmers needing to lease plots.

Young irrigator households prefer land to be registered in their name (Parry et al., 2022). However, young farmers rent a higher proportion of their farmland relative to older farmers (Chamberlin et al., 2021), which creates an additional cost. Like Marewo (2024), the findings show that social capital is advantageous, with young farmers liaising with scheme leaders, the Chief and AGRITEX officers for advice on potential plots to lease and parents sometimes assist in this process. Additionally, plot holders reported they preferred to lease to those with some demonstrated level of permanency and productivity. Hence, it is difficult for would-be farmers to enter leasing arrangements, making entry via use of parents’ plots an important pathway. While Chipenda and Tom (2019) found that arrangements in resettlement areas included an exchange of cash and draught services, exchange on Silalatshani was a mix of goods and services. While there were some instances of the plot holder taking advantage of the leasee, there appeared to be sufficient scope in flexibility, overall, such that leasing arrangements were mutually beneficial.

Recent research also finds that young farmers have bought land on scheme (T. Dube, personal communication, May 2024), even though the right to dispose of property provided for in the Constitution does not extend to state land (Bhatasara, 2019). Anecdotal evidence suggests these informal arrangements for change of ownership—that extends to buying homesteads and dryland farms—is facilitated at local level by the village Chief or the IMC with RDCs also aware of the process. Like the widespread leasing of plots, the accommodation of cultural practices helps avoid sub-optimal outcomes on and around schemes (Chitata et al., 2022), which also links with literature on the lowering of transaction costs through the alignment of informal and formal institutions (Pagan, 2009).

The components influencing parents’ decision-making on use and transfer are shown in the IADF’s action situation (Fig. 4). In making plot

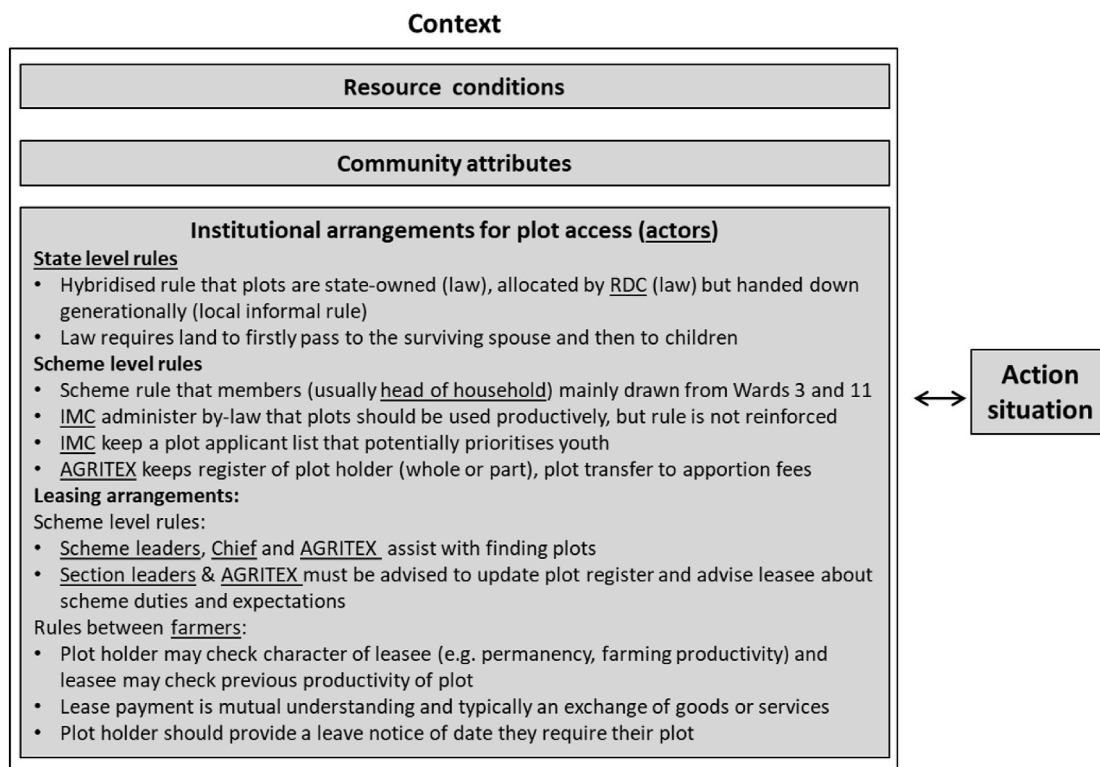


Fig. 3. Institutional arrangements for plot access exogenous to the action situation.

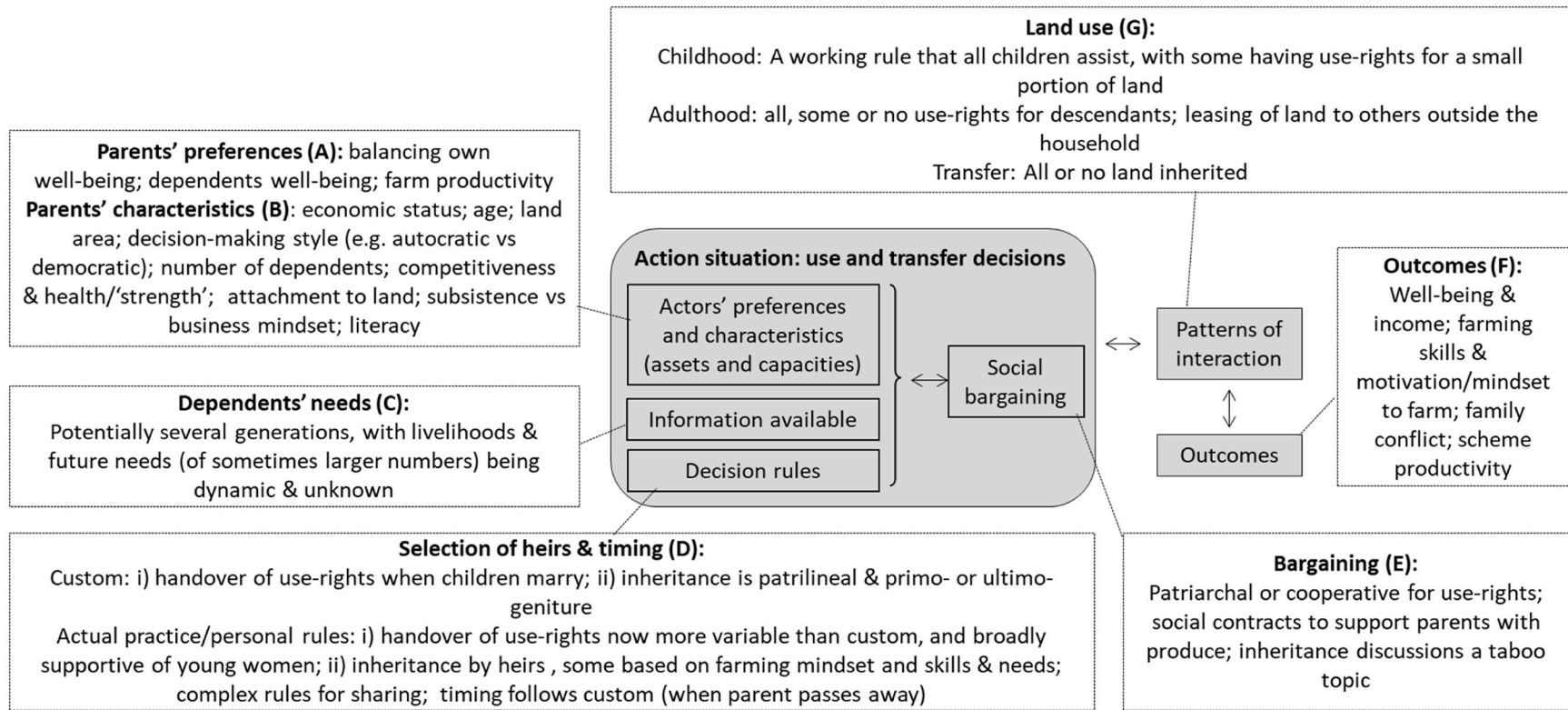


Fig. 4. Parents' decision-making on plot use and transfer in the IADF's action situation.

use decisions, parents are balancing supporting their own well-being, their dependents' needs, and managing farm productivity to meet scheme by-laws (Fig. 4, A). Parents will weigh these preferences differently over time, as their characteristics and circumstances change. Parents' decision-making and reluctance to hand over land—including those deemed elderly—and sometimes mistrust of the next generation, is influenced by a wide range of characteristics (Fig. 4, B). Even within the small sample interviewed, parents differed by marital status, age, economic status, complexity of family structure, and number of dependents (Table B2). In several cases, grandparents were caring for large numbers of grandchildren and orphans, with their own children often having relocated for work or died, and with school and employment outcomes for the youngest as yet unknown (C). With few productive livelihood opportunities around the scheme (Parry, 2024) and Zimbabwe's crisis-driven economy, young people's needs vary as they come and go from the scheme in search for livelihood opportunities.

The findings also show that parents/grandparents decision-making style, attachment to land, farming mindset, competitiveness and ability to farm influence decisions on younger household members' access to land. There is some evidence that plots are less likely to be shared by older heads of households and those less literate. In a location where traditional lands became state-owned and a later hybrid arrangement reinstated a system of descent, a strong attachment to land is not surprising. Aspects such as attachment, mindset and competitiveness link with Conway et al. (2019, 2021) who place much importance on the emotional and social benefits that older farmers derive from land, which makes succession more challenging: for example, a competitive agricultural culture (for individuals and their community), a deep seated reluctance to let go, or an inability to see a different future. Interestingly, financial security was not mentioned as a specific challenge. However, limited or no social support makes it much more likely that elderly farmers will need to retain control over land assets unless they can be assured of receiving regular post-transfer benefits.

Early engagement of children in farming fostered skills, discipline, cooperation and motivation for farming. This study, however, found variability in parents' styles of decision-making (Fig. 4, B), with evidence of both autocratic and cooperative approaches to plot access. Hence, engagement was either mutually beneficial, but sometimes coercive; however, harsh discipline and respect for the older generation is a common way to control labour in farming societies (White, 2020). Motivation to farm was enhanced through a child being given their own portion of land to use (Fig. 4, G) and exposure to the economic benefits of farming, particularly from parents with a more business-oriented mindset (Fig. 4, B). While the hard work associated with irrigation was suggested as a deterrent for future involvement for some young people, this could also be explained as a perceived inadequate return on effort. Early learning about irrigation practices was also deemed beneficial.

Again, some parents are supportive of their adult children having use-rights for family plots, as there is benefit in supporting the next generation's independence and well-being. A sharing of land with parents in childhood and pre-adulthood and a transition to more autonomous plot use in adulthood (Fig. 4, G), is a pattern also observed in dryland farming in Zimbabwe (Scoones et al., 2019). In locations with economic instability and poor welfare systems, families rely on inter-generational contracts whereby parents care for their children and vice versa as parents age (Kabeer, 2000). Hence, it is advantageous for parents to ensure their children have farming skills so they can more ably support their parents when they are older. The findings provide evidence of expectations around provision of produce when young farmers use family plots (Fig. 4, E), but also some evidence that these contracts constrain young farmers' profits (Fig. 3, E). These contracts will vary across households depending on their levels of poverty (Kabeer, 2000), suggesting households that are relatively better off may place fewer expectations when granting use-rights to their children. Some parents were reluctant to share, leasing their plots to non-family members, or

even withholding transfer of a plot up to when they died. Globally, it is common for farmers to not have a successor (White, 2020); however, the extent of this as an issue on smallholder irrigation schemes is yet to be determined.

Decision rules for the selection of those who inherit were variable and exhibited both customary and personal rules (D). While it can be difficult to distinguish between customs and practice as they transition over time (Kabeer, 2000; White, 2020), there was evidence of patrilineal transfer (primo- or ultimo-geniture), but with parents exercising more choices compared to customary rules. The prioritisation of male heirs is typical globally and across many African cultures, and the findings also concur with literature that young women are expected to gain entry to farming through marriage (Scoones et al., 2019; Tadele and Gella, 2014; White, 2020). Transfer to young women was possible but appeared rare at Silalatshani, and may also have been ambiguously recorded or contested. However, a variety of personal practices were employed to support young women's access to land when there was a need, which reflects Chitata et al.'s (2022) notions that land access arrangements are often motivated by moral imperatives and care. As suggested by Mutopo (2011 cited in Lawry et al., 2023), women may also be using cultural negotiations to access land.

In addition to meeting their needs post-transfer, the findings show that some parents are considering farming mindset, skills and their dependent's needs, when making decisions about who land is transferred to. Early positive experiences and skills development will influence children's mindset, but decisions were more difficult when the needs of dependents were unknown and evolving. In households with complex household structures, decisions may lead to conflict, and land access may be harder for some more vulnerable groups: for example and similar to Ishor et al. (2013), children who are orphans, illegitimate and from broken or polygamous marriages.

This research suggests parents' decision-making about plot use by younger household members is an ongoing and evolving process until formal transfer. This theorisation is supported by White (2020, p.86) who describes inheritance as "the last phase in an often longer process of transfer" of use-rights or ownership-like transfers. Farm succession research from developed countries, affirms that the process should be started early—even while parents are determining who wants to farm—as exit from farming should be confronted at an earlier life stage to engender a disposition towards retirement, and it is particularly important to 'satisfy' those that won't inherit (Conway et al., 2021; Stephens, 2022; Wheeler et al., 2012). The identification of a successor can help ensure the farm business enters or continues on a growth path (Duesberg et al., 2017). While a staged approach is beneficial, the final transfer of ownership is not something that Silalatshani's parents discussed with their children, which is supported by White (2020). There was no evidence of households on Silalatshani having actual succession plans. In farming and small business, in Africa and elsewhere, succession planning is recognised as beneficial for sustainable outcomes for family farms and rural communities: preventing discontinuity; supporting longevity; promoting growth and higher profits; and improving equity (AHA & GIZ, 2021; Breitenbach et al., 2024; Conway et al., 2021; Dumbo, 2018; Duesberg et al., 2017; Harris et al., 2012; Shumbambiri, 2023). While the benefits of succession were noted by some interviewees, it was felt this would be more difficult for scheme plots, which may be associated with their small size.

Ultimately, the land access decisions (F, Fig. 4) impact parents' and children's well-being and young people's livelihood options. Early experiences can encourage or discourage future engagement in farming, and inculcating a positive and business-oriented mindset supports scheme profitability. Further, late transfer may lead to discontinuity and stymie farm growth. Whereas, young people's potential for greater agility and openness to change—through being less wedded to a particular practice or a united rejection of a poor economic environment—should be facilitated to support transformation and change (Christiaensen et al., 2020; Glover and Sumberg, 2020). Critically, land

also has an important social security function that should not be sacrificed—with the findings showing that elderly farmers sometimes supported one or more generations and a number of orphans—and there is a challenge to advance inclusivity while protecting current beneficiaries (Lawry et al., 2023; White, 2020). While the evidence confirms a need for older farmers to be supported to exit farming to improve access for young farmers, the spectrum of inability versus reluctance and potentially deep-seated views related to attachment and being a farmer, suggests there is no one-size-fits all approach. Parents and elderly farmers are diverse and further research is essential to separate elderly farmers' so their challenges are understood, and the extent of the differing contexts can be identified.

6. Conclusion

Globally, farm transfer is complex and challenges associated with decision-making are not confined to Zimbabwe or southern Africa. This novel application of the IADF to Silalatshani smallholder irrigation scheme has successfully provided insight into the multi-level institutions and everyday dynamics enabling and constraining plot access and transfer on the scheme. In this way, the study contributes to extending the use of the IADF to multi-scale plot access analysis on smallholder schemes, and illustrates its value for analysing parental decision-making.

The diversity of households makes it unlikely there could be a one-size-fits all intervention, with institutional innovation required across several levels. The findings highlight several implications for policy and development. Firstly, not all young people will be interested or able to access plots on smallholder schemes. Parents' decision-making is hampered by the evolving and uncertain needs of their dependents, which is exacerbated by a constrained economic environment. Clearly, a broader landscape of opportunity is required around Silalatshani to help satisfy the needs of the dependents who won't inherit a scheme plot and this should help reduce parents' dilemma of choosing an appropriate successor. The rationale behind the scheme needs to be more strongly focused on stimulating rural development.

Secondly, there is some inequity of plot access, and increased demand for land should be anticipated as productivity continues to improve on Silalatshani. This challenge will be experienced unevenly between younger and older farmers and within the young farmer cohort. The participatory and multi-level learning and problem solving processes that have successfully supported institutional change on schemes could be further employed to consider cross-generational approaches to ensure adequate, more equitable and ongoing land access for young farmers. Possible areas to focus on include: a more transparent applicant list to extend opportunities beyond scheme households; group farming to make initial input costs more manageable, and build skills and social capital to move into independent leasing; training for potential successors that lack skills; and continuing to ensure all un- or under-used plots are managed by those that can use them more productively. Importantly, previous poor enforcement of the productivity by-law has benefited those struggling to use their plots productively and provided an important social security function. In the absence of state-level social support measures that extend to the self-employed and those in the informal economy, there may be scope to nudge plot holders unable to hand over land towards mutually beneficial and flexible leasing arrangements.

Thirdly, there is evidence that some households, particularly those with older and less literate household heads, have a greater struggle to hand over control of plots to younger generations. Therefore, any policy emphasis on facilitating young farmers' access to smallholder irrigation must include mechanisms to support less productive elderly farmers to exit farming. More attention could be paid to the emotional and social aspects that underpin reluctance within a community. Interventions that focus solely, for example, on financial support measures and neglect older farmers' loss of status, independence and identity through exiting

farming may produce sub-optimal outcomes. While some parents have a democratic style that fosters skills and motivation at an early age and support use-rights for adult children, others have an autocratic style that disempowers potential young farmers. Further, customs and practices favour delayed decision-making about the choice of successor; whereas, earlier consideration of final land transfer might be more effective for parents and their dependents. As is the case for small businesses more broadly, sensitive facilitation to foster attitudinal change about use-rights and succession planning could be beneficial.

Finally, there is scope for further research. Our qualitative research has supported theory building around succession and plot transfer being an ongoing and evolving process that commences in descendants early childhood. The analysis has also generated several testable hypotheses: for example, that i) parents with more progressive characteristics (e.g. democratic decision-making, business mindset) will have more effective succession processes and better outcomes for parents, dependents, and the schemes; ii) parents with more progressive characteristics are more likely to grant use and/or ownership rights to female descendants; iii) parents with higher wealth and/or access to sufficient social security can give higher priority to their dependents needs; or iv) older heads of households and those less literate are less likely to share plots. Further research could also explore the applicability of the findings to other locations and the extent of the impact of farm transfer concerns on continuity of plot usage and smallholder irrigation scheme productivity. This should help prioritise the issues having the greatest impact on potential young male and female farmers and scheme productivity. As farm transfer encompasses various concerns—social security needs, community attitudes towards transfer and 'retirement' from farming, emotional, social and economic constraints and the suitability of successors—research that explores these concerns relative to household demographics and plot usage outcomes should identify locally appropriate interventions. This could include identifying and learning from households that have more inclusive approaches to intergenerational transfer. Overall, access for existing and would-be young farmers is vital to ensure an age-diverse farming population and generational renewal on smallholder irrigation schemes.

CRediT authorship contribution statement

Karen Parry: Writing – review & editing, Writing – original draft, Visualization, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Bethany Cooper:** Writing – review & editing, Supervision. **Henning Bjornlund:** Writing – review & editing, Supervision. **Lin Crase:** Writing – review & editing, Supervision. **Martin Moyo:** Writing – review & editing. **Thabani Dube:** Writing – review & editing.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Karen Parry reports financial support was provided by Australian Centre for International Agricultural Research. Karen Parry reports a relationship with Australian Centre for International Agricultural Research that includes: funding grants. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jrurstud.2025.103576>.

Data availability

The data that has been used is confidential.

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