



**Pathways for irrigation
development:
policies and irrigation
performance in
Zimbabwe**
Working paper



PRISE
Pathways to resilience
in semi-arid economies

Research for climate-resilient futures

Pathways for irrigation development: policies and irrigation performance in Zimbabwe

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This working paper has been produced as part of a series of papers to guide the long-term research agenda of the Pathways to Resilience in Semi-arid Economies (PRISE) project. PRISE is a five-year, multi-country research project that generates new knowledge about how economic development in semi-arid regions can be made more equitable and resilient to climate change. This research was commissioned by FANRPAN as part of the project Increasing Irrigation Water Productivity in Mozambique, Tanzania and Zimbabwe through On-Farm Monitoring, Adaptive Management and Agricultural Innovation Platforms.

Front cover image:

A family works on their maize field, repairing pipes that were installed for irrigation.

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Key Messages

- Attention must be paid to the history and politics of irrigation development if we are to understand how policies and practices have shaped the outcomes of irrigation investments.
- The current drought in Zimbabwe highlights the interconnections between the policy outcomes of food security and poverty reduction, economic growth and climate resilience. Irrigation is presented as a 'silver bullet' solution, but this is true only under certain conditions.
- The case of Zimbabwe shows smallholder farmers are not always the main beneficiaries of irrigation; careful consideration of who wins and who loses from irrigation investments is required to avoid perpetuating patterns of exclusion.
- Improving performance in the irrigation sector will require a range of solutions at different scales: some of these are technical or managerial in nature but many relate to the political or institutional environment and are likely to be more challenging to implement.

Abbreviations

AfDB	African Development Bank
AGRITEX	Department of Agriculture, Technical and Extension Services
AgWA	Partnership for Agricultural Water for Africa
ARDA	Agricultural and Rural Development Authority
CAADP	Comprehensive Africa Agricultural Development Programme
DFID	Department for International Development
DOI	Department of Irrigation
ESAP	Economic Structural Adjustment Programme
EU	European Union
FAO	Food and Agriculture Organization
FANRPAN	Food Agriculture and Natural Resources Policy Analysis Network
FTLRP	Fast-Track Land Reform Programme
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIZ	German Agency for International Cooperation
GoZ	Government of Zimbabwe
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IFI	International Financial Institution
IMC	Irrigation Management Committee
IMF	International Monetary Fund
IMT	Irrigation Management Transfer
INGO	International Non-Governmental Organisation
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
MAMID	Ministry of Agriculture, Mechanisation and Irrigation Development
MEWC	Ministry of Environment, Water and Climate
NAFSN	New Alliance for Food Security and Nutrition
NEPAD	New Economic Partnership for Africa's Development
NFIF	National Farm Irrigation Fund
NR	Natural Region
O&M	Operations and Maintenance
ODI	Overseas Development Institute
PIM	Participatory Irrigation Management
PPP	Purchasing Power Parity
PRISE	Pathways to Resilience in Semiarid Economies
RSOP	River System Outline Plan

SDC	Swiss Agency for Development and Cooperation
UK	United Kingdom
UNDP	United Nations Development Programme
US	United States
USAID	US Agency for International Development
ZANU-PF	Zimbabwe African National Union – Patriotic Front
Zim Asset	Zimbabwe’s Agenda for Sustainable Socio-Economic Transformation
ZINWA	Zimbabwe National Water Authority

Executive summary

Amid global concerns over rising food and fuel prices, changing diets and climate change, irrigated agriculture has an important role to play in increasing food production in an uncertain and resource-constrained world. For many countries in sub-Saharan Africa, it is also a key part of strategies to boost economic growth and tackle rural poverty. However, scepticism remains in some quarters given the disappointments of past irrigation investments, concerns over land and water grabs and a lack of sufficient evidence regarding what works, why and where, and who benefits. We argue that attention must be paid to the history and politics of irrigation development, in order to understand how policies and practices have evolved over time, and what the outcomes have been.

This report presents the findings of a rapid review to determine the policies and politics that have shaped irrigation practice and performance in Zimbabwe over the past 40–50 years. We conducted a political analysis to assess how politics and specific interests shape technical performance and outcomes, and the trade-offs between them. Based on this, we identified opportunities for innovation in irrigation policy and practice, with a view to charting more sustainable and resilient pathways for future irrigation development.

We combined a literature review with in-country interviews and short site visits, exploring the evolution of irrigation over time, the drivers of change, who benefited and lost from irrigation investments and how irrigation development could better contribute to poverty reduction, economic growth and climate resilience. We were particularly interested in the role irrigation plays in contexts characterised by high rainfall variability and increasing water scarcity. In Zimbabwe, we focused primarily on the Silalatshani and Mkoba smallholder irrigation schemes, located in Insiza and Gweru districts of Zimbabwe and managed by farmers with the support of the state.

Zimbabwe's political and economic destiny, and that of its people, has inextricably been linked to the question of land. Land has been the source of past and current wrongs, violence and exclusion. Therefore, it makes sense to start from the land to bring about change that delivers on the goals of food security and poverty reduction (in a country where 72% of people live below the national poverty line and 2.8 million are food insecure), economic growth (in a country that has shown immense potential to be a strong regional player in the past) and climate resilience (in a country that has been, is being and will be profoundly affected by climate variability and change).

The current drought emphasises how these outcomes are interconnected; climate change cuts across them, and exacerbates existing problems. Drought has increased food insecurity, leading to higher poverty levels and in turn undermining the country's economic growth. Irrigation has often been presented as a 'silver bullet' solution allowing farmers, and eventually the economy, to withstand the impacts of climate change. Our study highlights that this is true only under certain conditions, and that it is important to understand the bottlenecks that exist in the current irrigation system, and hinder its capacity to deliver on its promises.

At the international level, donors and international financial institutions suspended loans and long-term development aid to Zimbabwe after the

controversial land reform of the 2000s, and because of the country's debt arrears. The concentration of their support in short-term humanitarian interventions, as well as international sanctions and the negative impacts of the dollarisation of the economy in 2009, have severely compromised investments in irrigation infrastructure and management.

At the national level, the difficulties of adopting the irrigation policy have resulted in a lack of vision for the sector. Interventions and investments in irrigation have been *ad hoc*, reacting to economic and political conditions rather than responding to clearly defined objectives. In addition, the prevalent discourse on irrigation has focused on food security at the expense of economic growth. The government has maintained a strong interventionist stance, using irrigation as a strategy for ensuring the subsistence of farmers, rather than making it financially viable and hence an activity benefiting the broader economy. The land reforms of 2000 have also affected agricultural productivity, by severely contributing to the decay of irrigation schemes and hindering farmers' access to loans for inputs.

At the scheme level, our analysis reveals that lack of appropriate management models and insecure land tenure regimes have resulted in inadequate investments in maintenance. Farmers do irrigation for subsistence, not as a business; they lack access to markets, finance, inputs; extension services are inadequate to respond to the many challenges they face.

Although smallholder farmers have been portrayed as the main beneficiaries of irrigation, this has not necessarily been the case. The irrigation discourse in Zimbabwe masks exclusion patterns, and in reality remains shaped around the interests of few. Irrigators are still better off than non-irrigators (especially in the context of current drought), but this can raise issues of equity within communities and between people living in the same region, eventually giving rise to conflicts. In the absence of appropriate mechanisms to guarantee access to markets and regulatory tools to ensure prices are to the advantage of farmers, markets benefit 'middlemen' more than farmers.

Our analysis also highlights that irrigation is not a silver bullet, but can be vulnerable to climate change itself. A blind focus on 'irrigation expansion' as a solution to mitigate the impacts of climate change may, if not appropriately managed, lead to increasing water scarcity. In the absence of social safety nets, this could lead to increasing poverty and eventually conflicts between irrigators and other farmers, or between irrigators and other water users.

Improving performance in the irrigation sector will require a range of solutions at different scales. While some of these are technical or managerial in nature, many relate to the political or institutional environment and are likely to be more challenging to implement. We suggest the following:

- *Managing water across scales and sectors (taking land issues into account):* Investments in expanding the irrigation sector need to be coupled with measures to allocate water effectively and equitably, and to monitor use, particularly in light of future climate change.
- *Attention to local institutions:* Clear roles and responsibilities, eventually enshrined in policies and strategies, and reflected in the mandate and resources of local level institutions, are needed.
- *Irrigation must be profitable:* Improving transport, storage and processing, and market information systems, alongside policies to

regulate market and input prices, will be necessary to make irrigation viable for smallholder farmers.

- *Ensuring benefits reach the poor and marginalised:* Investments should be based on assessments of resource availability and people's needs, instead of focusing on high-profile initiatives that target districts with higher potential, or where donors' presence is already well established, thus perpetuating the marginalisation of semi-arid areas where people are most vulnerable to drought.
- *Irrigation is not the only answer to increasing productivity:* Investments are also needed in agricultural value chains, water resources management and enabling institutions. There is also a need for a clear framework to evaluate performance outcomes at both scheme and sector level in terms of livelihood benefits and the sector's contribution to national policy objectives.

1. Introduction

1.1 Renewed interest in irrigation

Amid global concerns over rising food and fuel prices, changing diets and climate change, agriculture has reappeared on the development agenda. Irrigated agriculture, in particular, is thought to have an important role to play in increasing the production of food in an uncertain and resource-constrained world. For many countries in sub-Saharan Africa, such as Tanzania and Zimbabwe, it is also a key part of strategies to boost economic growth and tackle rural poverty.

In 2005, the Commission for Africa called for a doubling of irrigation coverage on the continent within 10 years. Momentum has since gathered pace, evident in regional initiatives such as the Partnership for Agricultural Water for Africa (AgWA),¹ the Comprehensive Agriculture Development Programme (CAADP)² and the New Alliance for Food Security and Nutrition (NAFSN). However, scepticism remains in some quarters, given the disappointments of past irrigation investments, concerns over land and water grabs and a lack of sufficient evidence regarding what works, why and where, and who benefits.

This report is based on the premise that we must pay attention to the history and politics of irrigation development if we are to understand the way policies and practices have evolved over time, and what the outcomes have been. We seek to shed light on why the sector continues to underperform and how, in future, it may better

contribute to equitable and transformative economic growth and climate resilience. While we recognise that technical and managerial aspects are important for performance, our focus in this report is on policy, institutions and the political economy of irrigation development.

1.2 African experiences to date

Irrigation has played an important role in agricultural modernisation around the world. However, outside of North Africa, irrigation is little practised on the African continent in comparison with in other regions (Neumann et al., 2011). In 2006, African countries collectively irrigated just 5.4% of their cultivated land, compared with a global average of around 20% and almost 40% in Asia (FAO, 2011). Nonetheless, the equipped area could increase substantially over the next 30–40 years as the sector is seeing increasing investment from both public and private actors. Frenken (2005) estimates that Africa has the potential to irrigate over 40 million ha in total, based on available land and water resources. However, such figures should be treated with caution. Country estimates of irrigation coverage and potential, on which regional estimates are based, can vary considerably depending on the methods used. For example, some estimates of irrigation potential are based on land resources alone, and, even where water resources are accounted for, this does not necessarily factor in the impacts of irrigation development on river flows or groundwater. There are also considerable gaps in the data for certain variables, such as type of irrigation used or area actually being irrigated as opposed to equipped (ibid.).

Throughout Africa's history, discourses relating to the use of land and water resources, the expected contribution of agriculture to national development and the respective role of the irrigation sector have evolved (Oates et al., 2015). Research in Ethiopia, Morocco and Mozambique shows that changes in policy have been driven to differing extents by political and ideological shifts, donor agendas and political projects, among other factors, and objectives have often been incoherent. These changes in irrigation policy have been mirrored in the fates of particular schemes.

Efforts to boost agricultural production in Africa began as far back as the 1920s under colonial administrations, and included large-scale irrigation developments in Sudan and Niger (Woodhouse and Ganho, 2011). Prior to this, irrigation had been practised on a relatively small scale,³ using traditional technologies and managed through customary institutions.⁴ Whilst traditional practices have evolved over decades and are (on the whole) relatively well adapted to local conditions, performance problems have plagued public investments in irrigation (both large and small) from the start.⁵ In part because of the disappointments of centrally

³ An important exception being the Nile in Egypt.

⁴ Traditional practices include, for example, the diversion of water from streams or rivers using earthen canals (e.g. in the Kilimanjaro Mountains of Tanzania) and the trapping of floodwater in shallow basins (e.g. along the Nile in Egypt).

⁵ Challenges include inappropriate design for local conditions, poor construction and/or maintenance, unreliable water supplies, ineffective institutions for collective scheme management, a lack of access to inputs or markets and high costs set against low profitability, among other factors (see Faurès et al., 2007; Merrey et al., 2007; Oates et al., 2015). Note that many of the problems encountered with large-scale irrigation are not unique to Africa but are also found in parts of Asia.

¹ AgWa provides support to the CAADP process and other agricultural water management initiatives in Africa.

² Under the New Partnership for Africa's Development (NEPAD).

managed large-scale irrigation, irrigation management transfer (IMT) and the closely related concept of participatory irrigation management (PIM) became popular instruments for reform in the 1970–80s (Howarth et al., 2007; Merrey et al., 2007). Following structural adjustment in the 1980s and 1990s, many African countries actively sought to encourage private sector investment, including agri-businesses (see Oates et al., 2015 for a more detailed history).

For many developing countries, irrigation will continue to represent a substantial share of agricultural

investment in the near future (Faurès et al., 2007). Nevertheless, enduring challenges remain in managing irrigation to increase agricultural output, ensure sustainability and contribute to national development objectives. Although positive examples do exist, they tend to be isolated and context-specific (Wiggins and Leturque, 2010). Meanwhile, growth in the private sector has raised important questions around rights and regulation, the role of the state and who benefits from the development of land and water resources (Calow and Mason,

2014). In addition to technical or managerial interventions, Oates et al. (2015) point to the need to account for water at multiple levels, improve monitoring and sector coordination and manage trade-offs transparently. Climate change places an additional strain on sustainable land and water management and food production. New policies and deeper-seated structural changes will likely be necessary to address these challenges (Kadigi et al., 2012; Pavelic et al., 2013; Chiroro, 2015) (Box 1).

Box 1: Irrigation and climate change

Irrigation is increasingly viewed as a strategy to mitigate the impacts of climate variability and change. Large-scale irrigation schemes have the potential to buffer farmers from dependence on food aid in times of crop failure and drought (Deressa et al., 2009). Small-scale irrigation is seen as key to improving agricultural productivity and incrementally increasing the resilience of rural livelihoods (Sakaki and Koga, 2011; The Montpellier Panel, 2012; Chiroro, 2015).

At the same time, climate change will have a large impact on the potential for irrigation expansion (You et al., 2011). It is therefore essential that climate change concerns be incorporated in the design and management of irrigation schemes (Kurukuklasuriya et al. 2006; Davis and Hirji, 2011; Tubiello and van der Velde, 2012; Chiroro, 2015). Focusing on arid and semi-arid regions in particular, the literature suggests several ways to do this, including through technical models and predictions for climate change effects on irrigation systems (Fischer et al., 2007; Mendelson and Seo, 2007), and by increasing the efficiency of irrigation systems in terms of water management, timing, weather patterns, etc. (Pereira et al., 2002; Issar and Adar, 2010; Zhou et al., 2010).

It is thought that small-scale irrigation as an adaptation method is more likely to be successful if there are concomitant policies to provide local farmers with information on changing risks and alternative production techniques. Policies also need to facilitate access to the financial means to adapt the physical systems (Deressa et al., 2009; Lankford, 2009; Sakaki and Koga, 2011). When addressing the vulnerabilities of poor farmers, it is also important to consider existing coping strategies, human relationships and social norms (Sakaki and Koga, 2011). Ziervogel et al. (2006) similarly argue that climate change adaptation has a social and political dimension, and is not solely governed by environmental or economic concerns, which can determine options and outcomes.

Despite these useful insights, there has been surprisingly little critical reflection in the literature on the limitations of irrigation as an adaptation strategy in different contexts, or the potential for maladaptation. More needs to be done to understand the implications of current policy decisions for resilience and the trade-offs involved. Moreover, a noticeable gap is the theorising and testing of concepts such as adaptive capacity or resilience as they relate to irrigation.

1.3 This report

This report presents the findings of a rapid review to determine the policies and politics that have shaped irrigation practice and performance in Zimbabwe over the past 40–50 years. It is one of two studies commissioned by the Food Agriculture and Natural Resources Policy Analysis Network (FANRPAN)⁶ with additional funding from the Pathways to Resilience in Semiarid Economies (PRISE) consortium,⁷ building on previous work conducted by the Overseas Development Institute (ODI) (see Oates et al. 2015). The companion study examines Tanzania’s irrigation sector (Oates, 2016).

The objective of the research is to identify opportunities for innovation in irrigation policy and practice, with a view to charting more sustainable and resilient pathways for future

⁶ <http://www.fanrpan.org/>

⁷ <http://prise.odi.org/>

irrigation development. We combine a review of the literature with in-country interviews and short site visits, guided by the following questions:

- How has the irrigation sector evolved over time?
- What have been the drivers of change?
- Why has performance been disappointing?
- Who has benefited and who has lost from irrigation investments?
- How could irrigation development better contribute to poverty reduction, economic growth and climate resilience?

The focus is primarily on smallholder irrigation schemes managed by farmers and supported by the state, although we also touch on other governance arrangements. We are particularly interested in the role irrigation plays in contexts characterised by high

rainfall variability and increasing water scarcity, whether physical (such as in arid or semi-arid areas of Zimbabwe) or economic scarcity (as in the Rufiji River Basin, Tanzania).

This report is structured as follows. Section 2 briefly outlines the study methodology, followed by an overview of the Zimbabwe country context (climate, rainfall and water as well as economic and social development, population and poverty information) in Section 3. Section 3 also outlines the main characteristics of the agriculture sector in Zimbabwe, with a focus on irrigation, and describes the two irrigation schemes considered in this study. Section 4 presents the main research findings framed around bottlenecks, trade-offs and resilience outcomes. Finally, Section 5 provides a discussion and presents some policy recommendations.

2. Methodology

2.1 Research approach and methodology

This review was commissioned as part of FANRPAN's project on Increasing Irrigation Water Productivity in Mozambique, Tanzania and Zimbabwe through On-Farm Monitoring, Adaptive Management and Agricultural Innovation Platforms. This collaborative project is led by the Australian National University, and funded by the Australian government via the Australian International Food Security Research Centre of the Australian Centre for International Agricultural Research, with additional contributions from participating organisations.

The review was co-funded by the PRISE consortium, led by ODI. PRISE research focuses on mechanisms of economic growth and social development, including institutional and regulatory frameworks, markets and bases of human and natural capital. The consortium is funded under the Collaborative Adaptation Research Initiative in African and Asia, with financial support from the UK Department for International Development (DFID) and the International Development Research Centre (IDRC).

Building on ODI's recent research *Pathways for irrigation development in Africa – insights from Ethiopia, Morocco and Mozambique* (Oates et al. 2015), this study looks at past (40–50 years) and current trends in irrigation and related sector policies and institutional arrangements in Tanzania, towards identifying options for national and regional policy innovation. It aims at understanding the social and economic goals governments and donors are pursuing when investing

in irrigation, which options are being privileged and why (e.g. small- versus large-scale schemes) and whether they actually support or deliver on the intended goals. Besides improving water management and productivity, which is the focus of the Australian-funded project, we are interested more broadly in how irrigated agriculture can best support sustainable and resilient development, and what the benefits, trade-offs and equity implications of policy choices might be.

Guided by the research questions outlined above, we first undertook a rapid review of the country-specific literature to understand the policy and institutional framework for irrigation development, and the factors (external or internal) that have shaped the sector's evolution over the past 40–50 years. The review focused primarily on the national picture but also considered international, regional and local dynamics and trends, where relevant. It included, *inter alia*, key policy and strategy documents, political economy studies, case studies and assessments of sector performance.

The desk-based review was complemented by in-country consultations with experts based in Harare and Bulawayo, as well as brief visits to two smallholder irrigation sites, located in the Insiza and Gweru districts. A total of 28 interviews and two focus group discussions were held during a 10-day visit in March 2016. Respondents were selected based on their knowledge, experience and availability. At national level, this included experts in the agriculture, water and environment sectors, from government institutions, academia, donor organisations and international non-governmental

organisations (INGOs). At subnational level, we consulted representatives from the Insiza and Gweru district agricultural offices, members of irrigation associations and farmers.

Annex 1 presents the list of interviews conducted in Zimbabwe; Annex 2 details the interview guide.

2.2 The case study sites

Our study explored trends in irrigation policies and practices in Zimbabwe based on information we collected through interviews with irrigation experts and key stakeholders at national and scheme level. At scheme level, we focused on two small-scale schemes: Silalatshani and Mkoba (see Table 1). The Silalatshani (also known as Silalabuhwa) irrigation scheme is located in Insiza district in Natural Region (NR) IV of Zimbabwe (about 160 km from Bulawayo). It has a total of 442 ha of mostly fertile clay soils; each of its 845 farmers has an average of 0.5 ha of land for cropping. The Mkoba irrigation scheme, located in Gweru Rural district in NR III of Zimbabwe (about 220 km from Bulawayo) has a total of 10.1 ha. It has 75 farmers and each member has an average of 0.1 ha of land for cropping.⁸

Silalatshani and Mkoba are jointly managed irrigation schemes in communal areas. Land is owned and administered by the Government of Zimbabwe (GoZ) under the Communal Land Act of 1982, according to which the rural district councils allocate land for occupancy and use, in consultation with the chiefs (Sithole, 2002, in Moyo et al., 2016). Both irrigation

⁸ Information from Moyo et al. (2016) and interviews with respondents at district and scheme levels.

schemes are flood irrigated. Silalatshani's water is supplied by the Zimbabwe National Water Authority (ZINWA) from the Silalabuhwa Dam; the dam also serves commercial entities such as gold mines, a small town and schools.⁹ Mkoba receives water

⁹ In principle, water levies are paid on a per hectare basis, and water is supplied according to a roster. However, this is not enforced at Silalatshani and irrigators can access almost unlimited water. At the same time, irrigators have to pay the levy even if they do not use the land, which causes resentment towards ZINWA (Moyo et al., 2016; interviews with farmers in Silalatshani).

from a small dam that supplies only this scheme. In both schemes, water is transferred through lined main canals (see Moyo et al., 2016). The irrigation management committees (IMCs) are in charge of water supply and make decisions as to when to supply water to individual irrigators. Irrigators at Mkoba pay \$2.90/ha/month, and at Silalatshani they pay \$14/ha/month (ibid.).

Land utilisation at the schemes is low, with only 20% of the irrigated land area at Silalatshani and 70% at Mkoba being used (Moyo et al.,

2016). Farming systems at both schemes are subsistence in nature, with low crop diversity and productivity. High water-dependent maize is the dominant crop; other crops include groundnuts, sugar beans and wheat, which are grown predominantly for home consumption. Yields range between 5% and 15% of yield potential for Silalatshani and Mkoba, respectively; given the small average plot size, farmers do not manage to produce excess for sale.

Table 1: Key features of the case study schemes

	Silalatshani	Mkoba
Date irrigation began	1967 – established by GoZ	1968 – established by GoZ
Location	Insiza district, NR IV (about 160 km from Bulawayo)	Gweru district NR III (about 220 km from Bulawayo)
Water source	Flood irrigated; water supplied by ZINWA through Silalabuhwa dam	Flood irrigated; water comes from a small dam that supplies only the scheme (siltation problems)
Irrigation system	Partially lined canal system (gravity)	Partially lined canal system (gravity)
Total irrigable area	442 ha	10.1 ha
Actual irrigated area	20% of total	70% of total
Management (farmer group/ association)	IMCs	IMCs
Growing season	Year round	Year round
Land tenure	Jointly managed, in communal areas	Jointly managed, in communal areas
Plot sizes	0.5 ha (average) – 845 farmers	0.1 ha (average) – 75 farmers
Crops grown	Subsistence scheme with low crop diversity (maize is dominant; other crops are groundnut, sugar beans and wheat)	Subsistence scheme with low crop diversity (maize is dominant; other crops are groundnut, sugar beans and wheat)
Opportunities	<ul style="list-style-type: none"> • Availability of markets nearby • Irrigated production helps reduce food insecurity in this drought-prone area • Most irrigators have mobile phones so ICTs may present opportunities for disseminating market information 	<ul style="list-style-type: none"> • Availability of markets nearby • Irrigated production helps reduce food insecurity in this drought-prone area • Most irrigators have mobile phones so ICTs may present opportunities for disseminating market information
Key issues	<ul style="list-style-type: none"> • Limited access to inputs and implements (insufficient government or other financial support) • Unclear land tenure arrangements (insecurity of tenure) • Low utilisation of land: only 20% of irrigated land is used • Low production levels: yields are 5% of yield potential • Conflicts over water usage with ZINWA • Lack of infrastructure maintenance 	<ul style="list-style-type: none"> • Unclear land tenure arrangements (insecurity of tenure) • Utilisation of land: only 70% of irrigated land is used • Lack of infrastructure maintenance • Low production levels: yields are 15% of yield potential • Dam is silted and cannot deliver current irrigation water requirements throughout the year

Source: Summarised from Mdemu and Mziray (2014), supplemented by the authors' interview data

Figure 1: Physical map of Zimbabwe



Disclaimer
The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Source: FAO – AQUASTAT (2015), http://www.fao.org/nr/water/aquastat/countries_regions/zwe/index.stm.

2.3 Irrigation policy, practice and performance: key concepts

Irrigation performance can be understood and measured in different ways, and approaches to conceptualising indicators have implications for performance evaluations. Despite efforts to standardise some of these key indicators, researchers and practitioners continue to use a variety of methods to assess performance, making comparisons difficult (Lankford, 2012). In recent years, the field has also encompassed new criteria and perspectives, which can lead to conceptual confusion in evaluating irrigation performance (Chaponnière et al., 2012).

A distinction can be made between efforts to evaluate the technical performance of irrigation and those evaluating the outcomes of irrigation investments. The former is concerned with monitoring and measuring the function and direct outputs of irrigation investments. The latter is concerned with evaluating the contribution of irrigation investments to outcomes and policy objectives such as food security, poverty reduction and generation of exports.

Irrigation schemes can experience problems in technical performance owing to a range of factors. These include poor planning and design, declining soil fertility and productivity, financial unsustainability and deficits in operations and maintenance. Technical performance indicators, such as on yields, coverage, cost recovery and supply interruptions, provide entry points for identifying problems in performance (see Boss et al., 2005 for a comprehensive list of technical performance indicators).

Causal linkages between scheme technical performance and outcomes are more complex and

remain under-researched (Chaponnière et al., 2012). Poor technical performance can certainly undermine the achievement of intended outcomes. However, outcomes are conditioned by many other drivers and influences, making the attribution of outcomes to technical performance problematic (Forss et al., 2011). For example, observed poverty reduction may result from direct effects such as increased agricultural output, or indirect effects such as improved transportation infrastructure, or combinations of direct and indirect effects (Smith, 2004). Similarly, despite high technical performance, poverty levels may not fall if necessary off-scheme components of success, such as market access, are not in place. Despite the difficulties in measuring and attributing the contribution of irrigation schemes to policy objectives, these linkages can be evaluated qualitatively.

A distinction can be made between outcomes for scheme beneficiaries, such as improvements in farmer income, and outcomes for wider society, such as the generation of tax receipts. Irrigation schemes can potentially contribute to multiple policy objectives and outcomes, for both on-scheme and off-scheme beneficiaries. Rather than attempting to compare them directly, these outcomes and policy objectives can be framed in terms of economic growth, sustainability and social equity.

In this framing, economic growth encompasses income generation, employment, economic and livelihood diversification and the generation of exports and taxes. Sustainability addresses questions of the scheme's water demand and impact on water resources, its vulnerability to drought and the potential impacts of climate change and other issues of long-term financial, environmental and technical viability. Questions of

equity consider the extent to which and how the costs and benefits of the scheme are shared between farmers on the scheme, and between the scheme beneficiaries and broader society. An irrigation scheme may positively, negatively or not affect each of these issues, and setting objectives for irrigation policy and individual schemes usually involves making explicit or implicit trade-offs between these effects.

Technical performance and outcomes are closely related to how irrigation is practised. Irrigation practice is usually considered in terms of engineering and agronomic principles, technologies and techniques applied by scheme designers, managers and farmers. More broadly, the term can include consideration of scheme management and coordination, and other inputs associated with the irrigation scheme, such as technical assistance and access to agricultural inputs and markets. We conceptualise irrigation practice in terms of how irrigation investments are designed, implemented, managed and used on a day-to-day basis.

Technical performance and outcomes are significantly shaped by irrigation practice, although external factors such as market signals and environmental change are also influential. However, practice is not static, and evolves in response to experience, new knowledge and changing conditions. In particular, irrigation practice evolves in response to assessments of technical performance and achievement of objectives and outcomes.

Irrigation practice is also shaped by policy and embedded within a political context. Political discourse, for example on poverty reduction or economic growth, shapes agricultural and irrigation policy. In turn, development and economic policies influence investments and set objectives for irrigation practice

to achieve. Policy processes are rarely linear, and policy, investments, politics and practice all can influence each other (Figure 2) (see also Oates et al., 2015).

These political and policy contexts have consequences for irrigation practice. Setting objectives prioritises particular outcomes, and these shape decisions in scheme design, implementation and management. These choices can result in trade-offs between outcomes (e.g. high yields versus long-term sustainability) and the costs and benefits of irrigation to

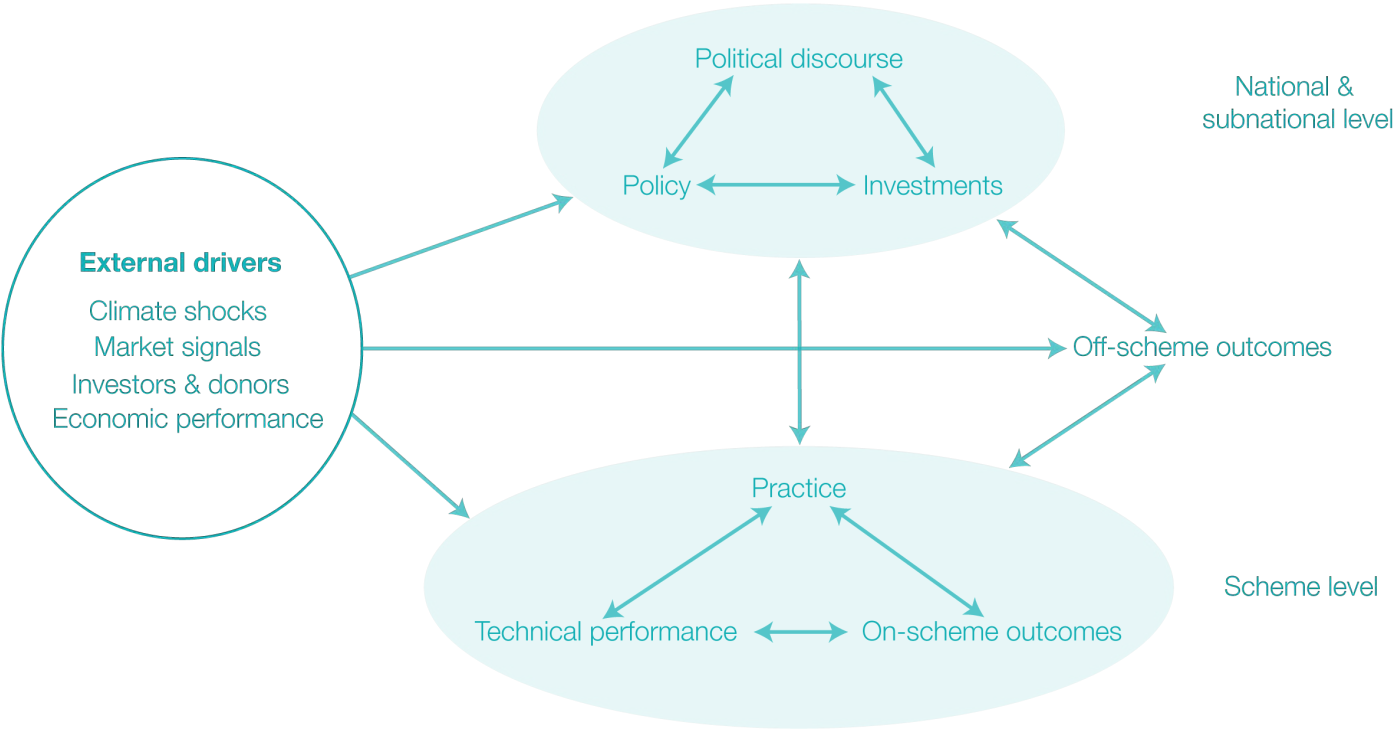
different groups (e.g. upstream versus downstream users). The extent to which – and how – political and institutional factors shape these trade-offs, and the creation of winners and losers, is a question of political economy.

Political economy analysis asks how actors operate within institutional rules and incentives to achieve their own objectives (e.g. Harris, 2013). Applied to issues of irrigation, it provides a framework for assessing how politics and specific interests shape technical performance and outcomes, the

trade-offs between them and the costs and benefits to different actors.

However, irrigation does not have to be a zero-sum game. By framing trade-offs and the distributions of costs and benefits between outcomes and groups as following from choices and practices shaped by policies and in turn by politics, we aim to identify lessons for strengthening irrigation performance against a range of criteria, and to improve public welfare.

Figure 2: Interactions between policy processes, irrigation practices and outcomes



Source: Authors.

3. Zimbabwe’s irrigation sector

3.1 Country context

Climate, rainfall and water resources

Zimbabwe, a landlocked country, is divided into seven river catchments (Gwayi, Sanyati, Manyame, Mazowe, Save, Runde and Mzingwane). With the exception of the Save and Runde, which join at the border with Mozambique and then flow into the Indian Ocean, all other main rivers drain into either the Zambezi or the Limpopo, Zimbabwe’s main rivers (FAO, 2016). Zimbabwe has limited groundwater resources, and relies mainly on surface water resources. Its total renewable water resources are 20,000 million m³/year, or 1,413 m³/per capita as of 2014 (ibid.).

Zimbabwe has a subtropical climate, with one rainy season from November to March, a cool winter season from April to August and the hottest and driest period from September to mid-November. Average annual rainfall is 657 mm, but it ranges from over 1,000 mm in the Eastern Highlands to 300–450 mm in the south. The country is divided into five agro-ecological regions (NRs) on the basis of their climatic conditions, farming potential and water resources:

- *NR III, IV and V* are semi-arid and arid areas (rainfall is less than 700 mm/year), and are characterised by semi-extensive and extensive farming of maize and drought-resistant crops; they are risky for rain-fed agriculture so they have received investments in small irrigation; they are suitable for cattle ranching.
- *NR I and II* have annual rainfall of more than 1,050 mm/year (I) and 700-1,050 mm/year (II); they are suitable for a broad range of agricultural activities, including dairying, tea, coffee, intensive livestock production, tobacco, maize, cotton and horticultural crops.

Observed changes in climate have resulted in more arid environments for agricultural production, which has shifted Zimbabwe’s five main agro-ecological zones. For example, Chinhoyi and Chibero and their surroundings have shifted from NR II to NR III, whereas Kwekwe and its surroundings have shifted from NR III to NR IV. In addition, NR I has reduced in size, NR II has shifted further east and NR III has shifted to the north (Mugabe et al., 2013).

Once known as the ‘breadbasket’ of the Southern African region, Zimbabwe is now characterised by chronic food insecurity and is dependent on international aid, particularly food aid. Climate records demonstrate that Zimbabwe is already beginning to experience the effects of climate change, notably increases in the frequency and intensity of extreme weather events – namely, tropical cyclones and drought – and increases in the daily minimum and maximum temperatures (of 2.6°C and 2°C over the past century, respectively) (Mugabe et al., 2013). The country is also prone to periodic droughts correlated to El Niño events, which have had dramatic impacts on agriculture in several farming seasons, including the most recent one of 2015/16 (see Box 2). These conditions are expected to cause water stress, rendering land marginal for agriculture, and threatening Zimbabwe’s economy and livelihoods, which are heavily dependent on rain-fed agriculture and climate-sensitive resources (Boko et al., 2007, in Mugabe et al., 2013; Brown et al., 2012).

Box 2: Effects of the current drought in Zimbabwe

As of mid-January 2016, over 90% of the country had received below average rainfall, with some southern and western areas receiving less than half of normal rainfall amounts for this period. A high proportion of households in the south did not plant cereals because of persistent dryness. In northern parts of the country, crops are in fair condition, but some are experiencing moisture stress in some marginal areas. Poor to critical water and pasture conditions in the south and parts of the north were also recorded. Thus, typical livelihood and coping options such as on- and off-farm casual labour remained limited, resulting in food insecurity.

Source: <http://www.fews.net/southern-africa/zimbabwe>.

Economic and social development

When it became independent in 1980, Zimbabwe appeared to have strong economic potential. It was one of the most industrialised economies in sub-Saharan Africa, with an extensive agro-processing industry and a relatively diversified industrial sector (Carmody, 1998, in Mugabe et al., 2013). However, levels of entrepreneurial activity and economic diversification in rural areas were low (Bird and Shepherd, 2003). Continued government deficits, unscheduled payments to war veterans, the cost of military involvement in Democratic Republic of Congo and the impact of land reform processes made per capita gross domestic product (GDP) sharply decline after 2000 (by 50% between 1997 and 2008) (Mugabe et al., 2013).

In 2009, the country adopted a multicurrency regime (dollarisation), which ushered in macroeconomic stability and positive economic growth. During 2009–12, the economy rebounded, with growth rates averaging around 8.7% per year. Inflation stabilised; revenues and bank deposits recovered sharply. The country also embarked on its first Staff Monitored Programme with the International Monetary Fund (IMF) and began making ‘token’ payments on arrears to multilateral institutions. Social services are recovering amid resurgent public and donor spending. Zimbabwe’s Human Development Index ranking recovered to 155 in 2015 (UNDP, 2015). However, growth has slowed sharply since 2012 as the economy’s vulnerability to climate change and terms of trade shocks has resurfaced.

Population and poverty

Zimbabwe’s total population is estimated at 14.6 million (as of 2014), of whom 60% live in rural areas and 80% in arid and semi-arid areas (FAO, 2016). According to the World Bank, 21.4% of Zimbabweans were poor as of 2011, living with less than \$1.90 a day (at 2011 PPP).¹⁰ The highest poverty rates are registered in the provinces of Matabeleland North, Manicaland and Masvingo, which are also among the driest and least productive areas of Zimbabwe.¹¹ As of 2011, 33.5% of the population was undernourished (ibid.).

Several authors have attributed the high levels of poverty and vulnerability in Zimbabwe to adverse climatic conditions and low agricultural productivity (as the highest levels of poverty are found in semi-arid communal areas), as well as insecure land and housing tenure, economic crisis and declining access to local and national markets, agro-inputs and public services (see, e.g., Bird and Shepherd, 2003; Bird and Prowse, 2008; Pindiriri, 2015).

¹⁰ <http://data.worldbank.org/topic/poverty> (accessed 26 October 2016).

¹¹ Data from <http://www.ruralpovertyportal.org/country/home/tags/zimbabwe>

3.2 Current status of irrigation development

Zimbabwe has a dualistic agriculture sector, constituted by large-scale agriculture, which produces cash crops (in particular tobacco and grains), and by smallholder farmers producing food crops. While 56% of commercial farms are located in the most fertile natural regions (NR I, II, III), 75% of small-scale production is concentrated in semi-arid and arid natural regions (NR IV and V) (Table 2).

Commodities of significance to the poor are maize, sorghum, millet and groundnuts. Overall grain production in Zimbabwe has decreased since the 2000s, partly because the commercial farmers who once grew maize have shifted to high-value crops such as tobacco or horticulture. Maize production has been left to communal farmers, whose production is nonetheless affected by droughts and shortage of input. Sorghum and millet are more drought-tolerant crops than maize, but they are cultivated to a lesser extent as Zimbabweans prefer maize as their staple food. Cotton, produced for commercial use, is grown in the south-western and north-western regions of the country, but its prominence is declining because of low market prices (Mugabe et al., 2013).

Overall, agricultural production in Zimbabwe has suffered from weak support services, lack of credit and acute shortages of essential inputs; water scarcity is also a challenge for farmers in drier areas (Moyo et al., 2016; key interviews).

Table 2: Zimbabwe’s dualistic agriculture sector

Advanced, large-scale commercial agriculture	Smallholder agriculture
56% located in NR I, II and III	75% located in NR IV and V
Occupies 12 m ha in total	Occupies 16.3 m ha in total
Produces cash crops (e.g. tobacco and grain)	Produces food crops (especially maize)
Traditionally, commercial (large and small-scale) farmers of European origins	Traditionally, smallholder farmers of African origins

Source: Authors.

Following implementation of the Fast-Track Land Reform Programme (FTLRP) in June 2000, agriculture comprises four major farming sectors:

- **Large-scale commercial schemes:** In these schemes, land is owned by private individuals or groups, including estates and plantations. Before the FTLRP, all these schemes were operated by white farmers. According to the Food and Agriculture Organization (FAO) (citing UNESCO, 2008), some ‘indigenous large-scale commercial schemes’ have now emerged (FAO, 2016).
- **A1 and A2 irrigation schemes:** These schemes emerged as a result of the FTLRP, which split the commercial schemes and increased the area under smallholder irrigation. In A1 schemes, each household was allocated between 3 ha and 5 ha of arable land, with shared grazing and infrastructure. A2 schemes comprised small-, medium- and large-scale commercial farms with 99-year leases (Anseeuw et al., 2012).
- **Government-managed schemes** are developed and maintained by the Department of Agricultural Technical and Extension Services (AGRITEX), which is responsible for running government-owned estates and

farms and for agricultural development in rural areas.

- **Smallholder irrigation schemes:** In these schemes, land is owned by the state but ‘managed’ by groups of farmers (called IMCs), sharing water resources and infrastructure. Each family of farmers has an area of between 0.1 and 0.5 ha, and controls irrigation and farming activities in his/her plot (Makadho, 2008). Smallholder irrigation schemes can be either ‘part-time’ (farmers combine irrigation with dryland farming activities, and income from irrigation is used to supplement income from dryland production); or ‘full-time’ (farmers are occupied full-time with irrigated agriculture) (Mudima, n.d.).

The smallholder sector consists of 1.1 million communal farmers and 72,000 farmers in the old resettlement areas, as well as 141,000 A1 farmers, for a total of 1.3 million farmers. The small- to medium-scale commercial farm category, which before the reforms consisted of the pre-independence black leasehold lands commonly referred to as small-scale commercial farming areas, has been expanded from 8,000 to 22,000 with the introduction of small to medium-scale A2 farmers under leasehold tenure (Moyo and

Yeros, 2009, in Anseeuw et al., 2012).

Estimates from the Department of Irrigation (DOI) of Zimbabwe (in FAO, 2016) indicate that, as of 2014, 150,000 ha of land were equipped for full control irrigation, of which 124,000 ha actually irrigated (1999 data). Of these, there are 26,550 ha of surface irrigation, 112,500 ha of sprinkler irrigation and 10,950 of localised irrigation. However, satellite imagery reports that the situation on the ground differs from official data and, in 2012, only 102,000 ha were equipped for irrigation and operational; out of these, 51,000 ha were actually irrigated (World Bank, 2014, in FAO, 2016).

Historical overview

Even before independence, Zimbabwe relied on a network of dams, water supply and sewerage systems and irrigation systems to manage its highly variable climate and grow the economy (Davis and Hirji, 2015). Small-scale irrigation systems were regarded as a famine relief strategy for the small and impoverished farmers living on the country’s least productive lands (Makadho, 1994).

Following independence, development discourse steered away from government-managed schemes to focus on farmer- or private-managed irrigation schemes and application of market principles

in irrigation (Zawe, 2006). In 1985, the National Farm Irrigation Fund (NFIF) was established with the explicit mandate of expanding the area under irrigation in all sectors (Makadho, 1994).¹² AGRITEX acted as the ‘guardian’ of smallholder irrigation development in Zimbabwe (Zawe, 2006), aiming to improve the efficiency of these schemes, for example by introducing sprinkler systems (typically the technology used in large-scale commercial farms in NR I) (Makombe and Sampath, 1998).

However, the financial and institutional resources for maintaining and rehabilitating the network of dams and irrigation systems became an increasing constraint during the 1990s. As early as 1986 an assessment report of the US Agency for International Development (USAID) noted that the general level of irrigation development in Zimbabwe was ‘impressive’, although some small-scale irrigation schemes had ‘serious problems’ due to lack of maintenance (Podmore et al. 1986).¹³ Limited investments in the

development and maintenance of these areas meant irrigation expansion was limited – communal area irrigation increased by only about 4,200 ha in a decade, from 4,300 ha in 1983 to 8,500 ha in 1993. By 1999, there were a total of 11,000 ha of communal land under irrigation (FAO, 2000, in Mtisi, 2011). The 1990s were also characterised by high economic instability, with a large budget deficit and a rapid increase in inflation – from 7.3% in 1980 to 58.5% in 1999 – following the imposition of structural adjustment measures (Anseeuw et al., 2012).¹⁴

During this period, several national agricultural strategies were drafted in line with the liberal, market-oriented macroeconomic policy of the Economic Structural Adjustment Programme (ESAP).¹⁵ In 1994, FAO sponsored a draft policy on irrigation – the first of many attempts to integrate Zimbabwe’s disparate irrigation investments in a long-term vision (Makadho, 2008).¹⁶ However, all of these strategies saw only limited implementation, and the irrigation policy was not adopted. Political prioritisation of land reform and

resettlement programmes (see Box 3) tended to obscure other policy objectives for the agriculture sector, which was also weakened by frequent portfolio changes of agricultural components into different ministries (Anseeuw et al., 2012).

Agriculture was further affected by the declining macroeconomic context of the 2000s. Per capita GDP declined by 50% between 1997 and 2008 as a consequence of government deficits, unscheduled payments to war veterans and the cost of military involvement in Democratic Republic of Congo (Mugabe et al., 2013). In the same period, inflation was running at 500%, and the Zimbabwean dollar lost more than 99% of its real exchange value (Anseeuw et al., 2012). Capital flight, coupled with GoZ’s reluctance to enforce land titles (which reduced the collateral for bank loans), led to the collapse of dozens of banks (Richardson, 2005; Anseeuw et al., 2012; Mugabe et al., 2013). In the fallout, international financial institutions and donors reduced or suspended development aid.

These events deeply affected the agriculture sector, and irrigation development in particular. Commercial farmers left *en masse* for countries such as Ghana, Nigeria and Zambia, taking their knowledge of farming practices with them (Richardson, 2005). The deteriorating economy made it progressively more difficult for farmers to procure farm inputs and equipment, which in turn contributed to reduced productivity. Together with the 2001/02 drought, this resulted in widespread famine. Without adequate knowledge and resources for their maintenance, many irrigation schemes throughout the country fell in disrepair.

¹² However, the NFIF’s financial requirements excluded smallholder farmers, resulting in benefits accruing only to the large-scale commercial irrigate sector. The NFIF required that smallholders borrow money in groups. The farmers in the smallholder sector were not easily organised into groups. It also required that the farmers pay for the infield costs. Farmers in the smallholder sector are cash-constrained. These two constraints (group lending and cash) restricted borrowing by the smallholder sector (Makadho, 1994).

¹³ Scholars agree that this owed partly to the skewed access to water and distribution of land inherited by post-independence Zimbabwe. In 1994, 82% of the estimated 119,038 ha of land under irrigation belonged to large-scale commercial farms, and only 7% was in communal and resettlement areas (Draft Irrigation Policy 1994, in Mtisi, 2011). Small-scale commercial and resettlement farmers irrigated a total of 8,461 ha, spread around in about 80 irrigation schemes, on which each farmer had between 0.1 ha and 1 ha of land. The 1998 reform failed to bring about more equality in land distribution, given the inherent challenges of the ‘willing seller and willing buyer’ principle as a basis for land reform, the exorbitant price tags on commercial farmland on sale and limited political will to implement reforms (Mtisi, 2011).

¹⁴ Most scholars noted that the Economic Structural Adjustment Programme (ESAP) led to the deindustrialisation of the economy highlighted by the company closures (Bond, 2000; Raftopoulos, 2001), the decline of real wages in gross national income from 54% in 1987 to 39% in 1997 and high levels of unemployment due to retrenchments across the employment sector (in Mtisi, 2011).

¹⁵ Such as the Zimbabwe Agricultural Policy Framework and Strategy (1995–2020), later substituted by the National Agricultural Strategy Framework (2005–35) and augmented by the Agricultural Mission Statement Strategy Framework and Action Plan (2007–11).

¹⁶ The need for an irrigation policy had re-emerged particularly with the approval of the Land Acquisition Act in 1996, and the Water Act in 1998, which created several discrepancies between land ownership and water use in particular. The Land Acquisition Act created but failed to regulate the use and maintenance of common infrastructure. The Water Act of 1998 decentralised water management to the catchment level, but failed to specify how the new catchment councils should coordinate with IMCs and other local-level irrigation structures for water allocation. See Makadho (2008).

Box 3: Land and power in Zimbabwe

Since the colonial period Zimbabwe's political landscape has been shaped by the question of land rights, which have given rise to three *chimurengas* (conflicts over land appropriation).^{*} Under British colonial rule, Zimbabwe's land was divided between well-irrigated commercial farms, owned by about 4,500 white families and cultivating thousands of acres of tobacco, cotton or other cash crops, and smaller communal farms, where 840,000 black farmers 'eked out a living' (Njaya and Mazuru, 2010). After independence in 1980, Veteran President Robert Mugabe and the Zimbabwe African National Union – Patriotic Front (ZANU-PF) party made land redistribution a mainstay of their political agenda. They called to return the fertile 'stolen lands' to black Zimbabweans (Richardson, 2005).

However, the fertility of the land in Zimbabwe was determined not only by rainfall or soil quality but also by the prevailing property rights regime. Commercial farms had secure property titles that gave farmers incentives to manage their land and infrastructure, and the ability to secure loans from banks for farm inputs and equipment. Those institutions developed the most sophisticated water delivery system in Southern Africa, employing about 350,000 workers, and often providing money for local schools and clinics. By contrast, communal lands experienced common-property resource challenges. Without property titles, there was often squabbling over land use rights between village residents and the village chief, and the land became overused and eroded over time (Richardson, 2005).

Immediately after independence, land redistribution was guided by the Lancaster House Constitution: the 'willing buyer willing seller' approach provided for the protection of the property rights of landowners. GoZ also enacted several laws to facilitate a peaceful land redistribution process (Njaya and Mazuru, 2010). In 1990, the Constitution was amended to give GoZ the right to purchase land at government-set prices without the right of appeal. This made the compulsory acquisition of land for redistribution and resettlement possible, in a way legitimising the invasion campaign of the white-owned farms initiated by the war veterans. Hundreds of farmers and their farm workers were beaten, and some killed (Zimbabwe Human Rights NGO Forum, 2010).

In July 2000, President Mugabe officially launched the Fast-Track Land Reform Programme (FTLRP). A National Land Identification Committee was set up to identify land for redistribution to black farmers, the state was recognised as the official owner of all farmland in the country and former owners had no recourse to the courts or rights to compensation (Richardson, 2005; Zawe, 2006). Between 2000 and 2003, GoZ authorised the seizure of nearly all the country's 4,500 commercial farms (Plaut, 2011). The official goal was to divide the farms into hundreds of thousands of small plots for traditional black farmers. In practice, most plots ended up in the hands of Mugabe's political supporters and government officials, whose knowledge of farming was meagre (Richardson, 2005).

Source: Authors.

^{*} As described by Knox (2003), Zimbabwe has experienced three *chimurengas*. The first one occurred in the 1990s, when GoZ sought to resettle 160,000 families but managed to resettle only 50,000, and did not address inequity issues so that white farmers continued to enjoy prosperity at the expense of black farmers. The second *chimurenga* started in 1997, and culminated with Mugabe's plan in 1998 for land reform, widely criticised by donors for corruption and misuse of funds. The third *chimurenga* coincided with the launch of the FTLRP of 2000; war veterans, supported by Mugabe and its Zimbabwe African National Union – Patriotic Front (ZANU-PF) for fear of rebellions, started invading and occupying farms previously held by white farmers. The *chimurenga* mythology in Zimbabwe has become a core element of state survival and agrarian transformation, which has revolutionised the agricultural system.

Irrigation governance

At the national level, irrigation is under the mandate of the Department of Irrigation (DOI) of the Ministry of Agriculture, Mechanisation and Irrigation Development (MAMID). MAMID is responsible for the overall development and implementation of GoZ’s agriculture and irrigation policy; DOI is charged with the provision of irrigation services to farmers, including the planning, identification, design and construction of new irrigation schemes and the operation and management of existing ones. Under MAMID, the Department of Agricultural Technical and Extension Services (AGRITEX) provides technical and advisory services to the farmers. The Ministry of Environment, Water and Climate (MEWC) also plays a role in the irrigation subsector by formulating policies for the utilisation of water resources. All these ministries have representations at the provincial and district levels, although their names change from one province to the other.¹⁷

The Water Law of 1998 reformed water management in Zimbabwe based on the principles of decentralisation and stakeholders’ participation, informed by the internationally sponsored approach of Integrated Water Resources Management (IWRM). It established the Zimbabwe National Water Authority (ZINWA) as a parastatal agency tasked with the management of a water permit

¹⁷ Interviews conducted in March 2016 in Harare with several respondents from MAMID and MEWC.

system. It also constituted seven catchment councils, one for each water catchment, in turn divided into several sub-catchment councils. These new institutions were supposed to represent all stakeholders in a given catchment area. However, large users (commercial farms, estates, mines, cities) tended to have precedence over communal farmers. In addition, the mandate especially of sub-catchment councils often overlapped with that of local authorities (e.g. village chiefs), leading to confusion and disputes over who was in charge of allocating how much water to whom.¹⁸

At scheme level, the relevant governance structures vary by scheme type. The remaining large-scale commercial schemes are managed and run by their private owners. The Agriculture and Rural Development Authority (ARDA), also a parastatal agency, is responsible for the operation of government-owned irrigated estates and farms. In a minority of jointly managed schemes, the farmers and GoZ share the financial responsibility for operation and maintenance. Farmer-managed schemes are developed by GoZ, but owned and managed by the farmers, regrouped in IMCs. However, IMCs have no legal standing and their effectiveness varies from scheme to scheme.¹⁹

¹⁸ Interviews conducted in March 2016 in Harare with several respondents from MAMID, MEWC and ZINWA.

¹⁹ Interviews conducted in Harare and Bulawayo in March 2016 with several respondents from MAMID and NGOs.

Zimbabwe also receives support from multilateral and bilateral donors, focusing almost exclusively on small-scale irrigation in communal areas. Most of the donor-funded programmes are labelled ‘humanitarian’ and aimed at guaranteeing the food security of farmers in uncontested areas (i.e. mostly communal areas that have not been subjected to redistribution). FAO has played an important role in supporting MAMID’s efforts to develop an irrigation policy. FAO also typically coordinates efforts between GoZ and other INGOs and bilateral partners in the irrigation sector.²⁰

At present, GoZ is increasingly exploring bilateral agreements with ‘new’ partners, in particular the Brazilian, Chinese and Indian governments. MAMID has mobilised a loan of \$98 million from the Brazilian government under the More for Food Programme.²¹ Similar deals are under negotiation with the Chinese government, primarily focusing on technology transfers.²²

Table 3 presents a list of all international and national actors relevant to irrigation in Zimbabwe.

²⁰ Interview conducted in Harare in March 2016 with respondent from FAO.

²¹ A first tranche of \$38 million was released in September 2014 for the summer cropping (*The Herald*, 2014; key informants). MAMID is supposed to use this loan to buy irrigation and mechanisation equipment from selected Brazilian companies, and distribute them to communal areas, old resettlement areas and A1 farms.

²² Interview conducted in Harare on 1 March 2016 with representative of MAMID.

Table 3: Relevant actors in the irrigation sector in Zimbabwe

Scheme level
<ul style="list-style-type: none"> • IMCs: Constituted on a voluntary basis, they are responsible for the management of irrigation schemes • Village chiefs: traditionally have a role in allocating lands
District/provincial level
<ul style="list-style-type: none"> • Representatives of MAMID, AGRITEX, MEWC • Catchment and sub-catchment councils: represent MEWC at local level, issue and enforce water permits according to River System Outline Plans (RSOPs)
National level
<ul style="list-style-type: none"> • MEWC: leads water sector at national level, is represented at provincial and district levels • ZINWA: parastatal organisation, in charge of planning and management • MAMID: different departments – irrigation, economics and markets – responsible for planning, management (including rehabilitation) and development of irrigation schemes • AGRITEX: extension services to farmers at scheme, district and provincial level • Agricultural research centre: conducts research on agricultural products, inputs, technologies and livestock • ZINWA: development of water infrastructure + commercial functions of water provision (collects water fees) • National Climate Change Office (in MEWC): develops and implements National Climate Change Strategy (and draft policy under preparation), coordinates contributions of government authorities in other sectors
INGOs/multilateral and bilateral donors
<ul style="list-style-type: none"> • FAO: focus on smallholder irrigation (especially rehabilitation of communal schemes) and support of policy development efforts of GoZ (MAMID), coordination with other international organisations • EU: portfolio of projects for \$244 million, including on agricultural growth and irrigation (focus on smallholder farmers in communal areas), livestock support; and climate resilience, natural resource management and livelihoods • SDC: since 2011, project on smallholder irrigation in Masvinga province (rehabilitation of irrigation infrastructure and institutional capacity-building of IMCs, market linkages) • INGOs (World Vision, CARE International, SNV): irrigation (infrastructure rehabilitation and capacity-building as a strategy to improve smallholder farmers' resilience to climate impacts (and especially drought), linked to food security, nutrition and disaster risk reduction programming • UNDP–GEF: manages a portfolio of 171 projects focus on climate change mitigation and increase climate resilience of beneficiaries • Others: JICA (provision of technology and capacity-building), GIZ and DFID (focus on agricultural markets), 'new' donors e.g. Chinese and Brazilians focusing on technology transfers

Source: Authors.

Current policies and programmes on irrigation in Zimbabwe

Food security and nutrition remain fundamental priorities for GoZ; this is evident from commitments to various international, regional and national programmes and projects, including CAADP. Most of our respondents agreed irrigation was one of the most prominent topics on the governmental agenda, although with a strong focus on the ‘hardware’ component (building and maintaining irrigation infrastructure) rather than the ‘software’ (management and maintenance of the schemes). This attitude is reflected in the treatment of irrigation in policy documents and strategies.

Because Zimbabwe does not have an irrigation policy, irrigation is covered in other sectorial strategies (see Table 5). For example, the Zimbabwe’s Agenda for Sustainable Socio-Economic Transformation (Zim Asset) sets a

national development plan for the period 2013–18 under four key clusters, the first one being food security and nutrition. Irrigation features under this heading with plans to increase the area under irrigation from 160,000 ha to 2.2 million ha by 2018. Irrigation also forms a key part of the Comprehensive Agriculture Policy Framework (2012–32) and the Food and Nutrition Security Policy. MAMID is leading the process to develop an irrigation policy, with the support of FAO. As of March 2016, a draft was ready for consideration by the Parliament.²³

In light of the current drought, irrigation has been discussed as a strategy for increasing the resilience of farmers (and, ultimately, the agriculture sector as a whole) to climate change, climate variability and drought. In 2012, Zimbabwe developed a National Climate Change Response Strategy, which

²³ Interviews conducted in Harare in March 2016 with representatives of MAMID and FAO.

aims to mainstream climate change in all key sectors of the economy, and specifically for integrated management and development of agricultural water resources (Lotz-Sisitka and Urquhart, 2014).²⁴

Table 5 presents a summary of land, agricultural and food security policies and developments in Zimbabwe that have affected the development and status of the irrigation sector.

²⁴ The Ministry of Environment and Natural Resources Management (now MEWC) led the consultative process to develop the National Climate Change Response Strategy in 2012, involving other government ministries, civil society organisations, academic institutions and the private sector. It gives the Office of the President and Cabinet overall responsibility for decisions on climate change policy. A National Task Team on Climate Change has been established under the Directorate of the President’s Office. MEWC chairs the National Climate Change Committee, which comprises representatives from government ministries, and hosts the Climate Change Office, which coordinates climate change activities across ministries and organisations, including the private sector. See Lotz-Sisitka and Urquhart (2014).

Table 4: Relevant policies for irrigation sector in Zimbabwe

Policy/strategy	Relevant content for irrigation
1998 Water Act	Reformed the water sector by introducing (time limited) water permits, to be allocated by catchment councils and on the basis of 'user pays' and 'polluter pays' principles.
2000 Zimbabwe National Water Authority Acts	Establishes the ZINWA as a parastatal agency – in charge of water permits and water allocations, including for irrigation use.
2002 Environmental Management Act and 2003 Environmental Management Agency Act	Introduces mandatory environmental impact assessments before undertaking any activity, including irrigation development.
2000 Land Acquisition Act	Initiates the FTLRP – empowers the government to compulsorily acquire land (commercial farms) for resettlement purposes.
Zimbabwe's Agenda for Sustainable Socio-Economic Transformation (Zim Asset) 2013–18	Sets the objective of increasing the area under irrigation to 220,000 ha (from 160,000 ha) by 2018 through rehabilitation and modernisation of irrigation schemes and increase of power available and affordable for irrigation.
Zimbabwe's National Climate Change Response Strategy (2013)	Mainstreaming climate change in all the key sector of the economy; calls for integrated management and development of agricultural water resources.
Comprehensive Agricultural Policy Framework 2012–32	Includes provisions for rehabilitating and modernising irrigation infrastructure, developing new irrigation infrastructure and strengthening research on irrigation development and new technologies (objective 7.3).
Zimbabwe's Agricultural Investment Plan 2013–17	Aims to redesign and rehabilitate irrigation infrastructure – total equipped irrigation area of 175,000 ha by 2016.
Medium-Term Plan 2011–15	Focuses on rehabilitation of existing irrigation infrastructures and completion of irrigation projects to increase agricultural production.

Table 5: Summary of land, agricultural, food security and economic policies in Zimbabwe

Period	Sector	Policy/status	Description
1980-90	Land	Willing buyer, willing seller, resettlement programme	Government bound by the Lancaster House Agreement. Distributed 2.46 million ha in 1980–85 to model 12-acre schemes.
	Agriculture	High regulation and control policies	Dual agricultural system (inherited from colonial period); continuation of government controls, with heavy bias towards black small-scale and communal farmers, who received subsidised inputs and protected marketing. National food security is a priority.
	Economy	State-controlled economic growth	Strong state-led, infant industry protection, tough controls through tariffs, foreign exchange allocation, growth with equity.
1991-98	Land	Compulsory land acquisition	Legislation to acquire land compulsorily. Resettlement programme was slow and off target, owing to lack of promised donor support.
	Agriculture	Liberalised policies	Trade liberalisation began, based on macroeconomic reforms proposed by World Bank/IMF. Controls and subsidies from government cancelled, but grain sector remained partially controlled. Beginning of efforts to write national agricultural/irrigation policies.
	Food security	No official policy	Government prioritised food security by controlling trade in grains and funding relief aid in drought years.
	Economy	Structural adjustment programmes	IMF/World Bank-led, ESAP, export promotion, trade liberalisation, financial deregulation.
2000-08	Land	FTLRP	Politically motivated land invasions saw 7.3 million ha taken by black farmers. The programme attracted negative media attention worldwide.
	Agriculture	Return of regularisation	All efforts to draft national policies failed and the government started trade regulation again. The central bank bankrolled national agricultural projects, and controlled marketing of most produce, especially grain.
	Food security	No official policy	Reduced agricultural production and lack of funds dampened national food security programmes. Government relied on World Food Programme and other agencies for food security,
	Economy	Gradual collapse	Weakened state attempting to regain control, highly open but mixed economy, <i>ad hoc</i> state interventions, tight foreign exchange control regulations, price controls, import liberalisation, Economic Partnership Agreements (initialised).
2009-present	Agriculture	Mixed approach	Unity government party liberalised agricultural trade again (including for grain). Government and NGOs fund input projects to communal and resettled farmers.

Period	Sector	Policy/status	Description
	Food security	Food and nutrition policy	Threatened by El Niño droughts in 2014–16, called for international humanitarian interventions.
	Economy	Slow recovery	Weak state attempting to liberalise markets, <i>ad hoc</i> interventions, dollarisation of economy, liberalisation of almost all sectors (goods and services). Zim Asset strategy for economic growth. Lima agreement with international financial institutions (IFIs), which regain interest in investments in Zimbabwe, and attention from ‘new’ donors (particularly Brazil and China).

Source: Adapted from Anseeuw et al. (2012).

4. Research findings

4.1 Drivers of policy change

Irrigation has been an important component of Zimbabwe's economic and political development, and occupies a key place in Zimbabwe's development agenda. This role is defined in terms of irrigation's potential to increase the food security of smallholder farmers, increase resilience to climate shocks and variability and revitalise the country's economy. A number of internal and external factors, which we call 'drivers of change', have shaped the raft of policy and institutional reforms in the Zimbabwean agricultural and water sectors, and in the irrigation subsector. In our study, based on key interviews with irrigation experts, staff of GoZ, NGOs and donor agencies and farmers, we identified the following: politics and ideology, macroeconomic conditions, climate and environmental concerns and foreign assistance.

Politics and ideology

Irrigation has a long history in Zimbabwe. The three *chimurengas* (or conflicts over land appropriation) that have characterised Zimbabwe's recent history make it very clear that irrigation goes hand in hand with the country's political and economic system. A representative of MAMID noted that, *'What happens in Harare has deep repercussions on the day-to-day operations at scheme level, and on the daily life of farmers.'*²⁵

From the 1950s GoZ developed irrigation schemes in NR IV and V to settle black farmers displaced from areas designated for white commercial farmers (NR I, II and III).

*'The government said that small-scale irrigation was started for the purposes of food security and cash income for poor farmers; in reality it freed up the good land for commercial agriculture, by relocating smallholder farmers to less productive lands where they could only really do subsistence agriculture.'*²⁶ Back then, the government promoted farmer-managed smallholder schemes, as well as government-managed and jointly managed schemes, and made substantial investments in dam construction and irrigation infrastructure (see also Mugabe et al., 2013).²⁷

In the 1990s, GoZ showed limited interest in the agriculture sector. In line with the liberal, market-oriented macroeconomic policies imposed by ESAP²⁸, the then Ministry of Agriculture initiated programmes aimed at transferring the scheme management to farmers. These, however, had little success. *'These programmes were premised on the wrong argument; small-scale irrigation schemes were created to function with government's subsidies, and would not function otherwise.'*²⁹ Meanwhile, President Mugabe's ZANU-PF used the question of land reform to rebuild its waning political base (Zawe, 2006). After the 2000 FTLRP, the

government definitively abandoned the liberal policies of the 1990s, adopting a strong interventions approach in agriculture, with the primary goal of achieving food self-sufficiency (Anseeuw et al., 2012).

Today, irrigation remains a priority in Zimbabwe. The Zim Asset strategy plans to increase the area under irrigation over the next 25 years to 2.2 million ha, at an estimated cost of \$10 billion (GoZ, 2013). Current investments are also being directed to the rehabilitation of existing schemes. Irrigation is thus conceived as a way to achieve food security and poverty reduction. However, while *'Newspapers talk about irrigation every day'*,³⁰ there does not seem to be an equivalent commitment in the government's programming and budget expenditure.

Macroeconomic conditions

The structural adjustment measures of the 1990s had profound implications for key sectors of the economy and repercussions for irrigation policy and sector development. With the suspension of government's subsidies, many small-scale schemes fell in disrepair. The downward macroeconomic trends that followed in the 2000s further worsened the situation, by reducing the supply of basic agricultural inputs like fertilisers, seeds and crop chemicals, as well as electricity (Zawe, 2006). *'The main problem was the high inflation rate, which made it very difficult for the irrigation companies that had formed to support farmers after the land reform to continue operating.'*³¹

The economic problems that emerged as a consequence of the

²⁵ Interview conducted in Harare on 3 March 2016 with member of DOI/MAMID.

²⁶ Interview conducted on Skype on 23 February 2016 with researcher.

²⁷ According to official statistics, Zimbabwe has 2,200 dams, including 260 large ones. Of these, 850 were constructed by GoZ, and their permits are owned by ZINWA. The private dams are mostly small. The total capacity of dams is estimated at 99,930 million m³, which includes half of the total reservoir capacity of 188,000 million m³ of the Kariba Dam, shared with Zambia (World Bank, 2014).

²⁸ Such as the Zimbabwe Agricultural Policy Framework and Strategy (1995–2020), later substituted by the National Agricultural Strategy Framework (2005–35) and augmented by the Agricultural Mission Statement Strategy Framework and Action Plan (2007–11).

²⁹ Interview conducted on Skype on 23 February 2016 with researcher.

³⁰ Interview conducted in Harare on 3 March 2016 with member of DOI/MAMID.

³¹ Interview conducted in Harare on 3 March 2016 with member of DOI/MAMID.

land reform of 2000, and that culminated in 2008 with the almost total collapse of the Zimbabwean economy, affected the capacity of farmers to produce. Zawe (2006) noted, however, that the ability of irrigators to sustain production depended also on the cropping programmes prescribed by GoZ, the production modalities and the contacts and networks that irrigators were able to forge. The impact of the economic crisis was higher in those schemes where all irrigators chose a different cropping pattern than in those where there was a single cropping pattern and support from AGRITEX in terms of linking farmers to salesmen of fertilisers' companies (ibid.).

Climate and environmental concerns

Irrigation in Zimbabwe started as a strategy to mitigate the impacts of inclement climate conditions, and to offer higher yields despite an adverse climate, both for large commercial farms and for smallholders. In a way, climate resilience has always been at the heart of irrigation investments in Zimbabwe, although the linkage has been made explicit only recently.

Throughout time, droughts have also provided GoZ a compelling argument to justify investments and political decisions. As the current El Niño event unfolded, government and external actors started framing irrigation discourse in terms of mitigating the impacts of climate variability and change. A representative of MEWC said, *'Everyone is talking about the current drought; people want to understand what is happening and why it is happening; the government of Zimbabwe will invest substantial resources to reduce the negative impacts of climate change for farmers.'* This is also bringing development aid back to Zimbabwe. For example, the European Union (EU) has a portfolio of \$10 million in Zimbabwe, aimed at improving the climate resilience

of farmers through investments in irrigation and other livelihoods, and natural resource management.³²

Foreign assistance

Zimbabwe has had a 'troubled history' with traditional bilateral and multilateral donors, and the government has typically been suspicious of international agencies (Zawe, 2006). Before 2000, FAO, the EU and the International Fund for Agricultural Development (IFAD) had irrigation projects aimed at making small irrigation schemes economically independent. These included encouraging cash crop production, group savings and promoting participatory irrigation development.³³ However, faced with limited success and the difficulties of justifying engagement with GoZ after the controversial FTLRP of 2000, donors either withdrew or reduced their interventions in Zimbabwe's irrigation sector to 'humanitarian' objectives, targeting farmers in uncontested areas (i.e. mostly communal areas that have not been subjected to redistribution).³⁴

At present, GoZ is increasingly exploring bilateral agreements with 'new' partners, and in particular the Brazilian, Chinese and Indian governments. Typically, these agreements come in the form of loans or technology transfer programmes. For example, in the case of the More for Food Programme, GoZ has used a Brazilian loan to buy Brazilian irrigation equipment. *'It's a win-win for Brazil: they finance their own companies to produce and then export tractors, fertilisers'*, one respondent commented, *'but these loans need to be repaid, and some of the technologies, such as pivots,*

*are not appropriate for small-scale irrigation schemes.'*³⁵

It is interesting to note that there seems to be a renewed interest also of the traditional donors in the irrigation sector in Zimbabwe. For example, after the 2015 Lima Agreement, in which GoZ committed to clearing its debt arrears (amounting to \$1.8 billion) to the IFIs,³⁶ IFAD is exploring resuming lending to Zimbabwe. The first project would be on smallholder irrigation, with a budget of around \$30 million over six or seven years.³⁷ Bilateral donors such as the EU and SDC are also revisiting their engagement in the country. For instance, the EU signed a financial agreement with GoZ in February 2015 that should allow for more involvement of GoZ in the design and implementation of development programmes.³⁸

4.2 Bottlenecks to increasing agricultural productivity

The drivers of change listed above have had an impact on irrigation investments and performance in a series of ways, producing 'bottlenecks' to increased agricultural productivity in the country. We examine them below, with reference to both the national level and the two schemes we studied in Mkoba and Silalatshani (see Figure 3).

National level

According to our interviewees, one of the reasons why the irrigation sector in Zimbabwe has not been able to deliver on the promised outcomes of food security and economic growth is the lack of an

³² Interview conducted in Harare on 3 March 2016 with EU representative.

³³ Interview conducted on Skype on 23 February 2016 with researcher.

³⁴ Key interviews conducted in Harare in March 2016 with staff of EU, the Swiss Agency for Development and Cooperation (SDC) and FAO.

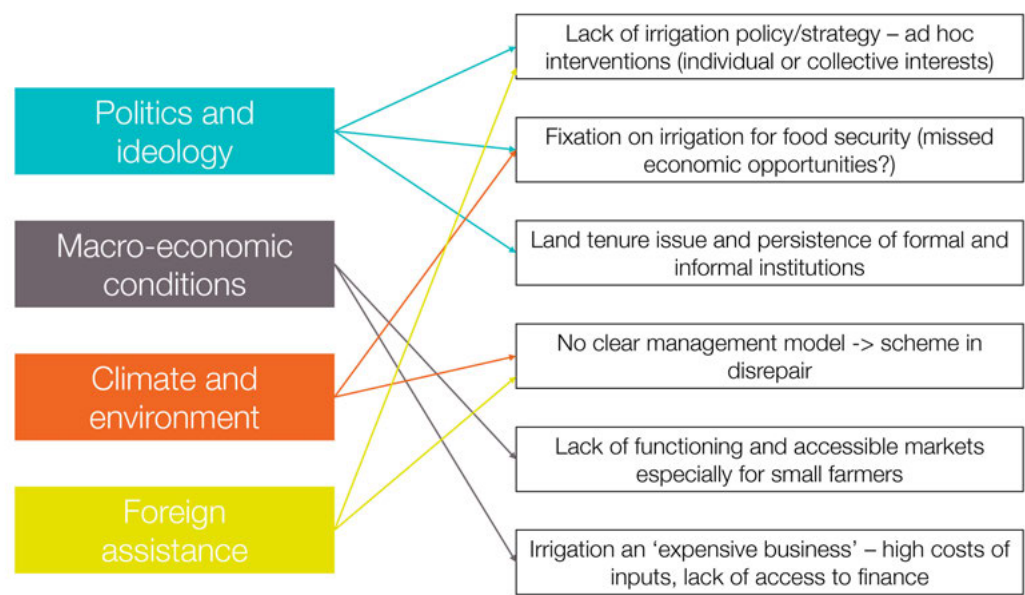
³⁵ Interview conducted in Harare on 3 March 2016 with MAMID representative.

³⁶ Information from interview with African Development Bank (AfDB) representative, and cross-checked with information from *The Herald* (2016).

³⁷ Interview conducted in Harare on 1 March 2016 with FAO representative.

³⁸ Interview conducted in Harare on 3 March 2016 with EU representative.

Figure 3: Linkages between drivers of change and bottlenecks to increased agricultural productivity



Source: Authors.

overall strategy guiding its development. As described above, Zimbabwe never had an irrigation policy, setting the long-term vision for the sector in the country. In a way, this gap can be attributed to the many changes and instability characterising the broader political and economic context of the country.³⁹

The many changes within both the agricultural and the water ministries, the different policy directions, incentives coming from donors and pressures from war veterans and other powerful constituencies have made it difficult to find a common

³⁹ An interviewee from a provincial MAMID office said, ‘From 1980, irrigation has been dealt with by very different ministries. At the beginning, it was a sub-section of the Ministry of Water and a sub-section of the Ministry of Agriculture (Ministry of Water would deal with dams and canals; everything else related to agricultural production would be competence of the Ministry of Agriculture). In 2003 the two sections were merged under a department under the Ministry of Water. In 2004, irrigation was moved to the Ministry of Agriculture. In 2005, it went back to Water. In 2006, it was under the Office of the President and Cabinet. In 2007, a Ministry of Irrigation was created but lasted for less than six months, then irrigation became again a department under the Ministry of Agriculture, where it has remained until now. In 2012 the Ministry of Agriculture became MAMID – irrigation is now a department in its own right.’

vision for the agriculture sector, and, as a consequence, the irrigation subsector, too.⁴⁰ Irrigation has been conceived as a ‘power base’, giving political weight (and funding) to the ministry with competencies over it.⁴¹ Paradoxically, its politicisation is what has made difficult to have a policy for it.

In turn, the lack of a comprehensive policy or strategic framework guiding the sector left it open to *ad hoc* interventions, reacting to ongoing socioeconomic and political developments, and often serving individual interests at the expense of the collective ones. In recent years, MAMID has spent its already limited budget on investments in the rehabilitation of individual schemes, without concurrently investing in the institutions and capacities to manage them, or the inputs and incentives farmers need to access markets. At the same time, the irrigation sector in Zimbabwe has not attracted foreign investments

⁴⁰ Information from key interviews with respondents from MAMID and donors’ agencies, conducted in Harare in March 2016.
⁴¹ Interview conducted in Harare on 1 March 2016 with representation of MAMID/DOI.

from bilateral and multilateral donors to the extent of other countries in Southern Africa, especially after the land reform of 2000.⁴²

The fixation on ‘irrigation for food security’ in the political discourse of President Mugabe and ZANU-PF, aimed at securing consensus in a country whose majority of the population is composed of smallholder farmers, has also proved a constraint to agricultural productivity. To make small-scale schemes sustainable, the government injected large subsidies, conditioning them to the production of maize (with the goal of ensuring the country’s self-sufficiency in food production) (Nhundu and Mushunje, 2010). After the 2000 FLTRP, the land management transfer was done hurriedly, not in a structured way; government institutions continued to act as if they were managing the schemes, providing subsidies to farmers especially for the production of wheat and maize. This meant farmers were not free to adapt their production to market

⁴² Interview conducted in Harare on 1 March 2016 with representation of MAMID/DOI.

demand, and had little incentive to maintain the schemes (traditionally conceived as government's job). Production figures inevitably went down.

Irrigation in Zimbabwe is an expensive business. A recent study of the Hamamavhaire and Mhende irrigation schemes in Chirumanzu district demonstrated that the total variable costs per hectare (composed of irrigation water cost, electricity cost, operations and maintenance (O&M) costs and other costs such as for seed, fertiliser, labour and transport) were highest for farmers using flood irrigation (\$1,273) because of its lower water use efficiency that inflates the cost of water, followed

by sprinkler system (\$957) and drip system (\$442) across all enterprises (Mupaso et al., 2014). However, the sprinkler system had the higher proportion of O&M and electricity costs. Overall, the study found farmers using the sprinkler system obtained significantly higher total gross margin per hectare (\$2,762), followed those using the flood system (\$2,190) and drip (\$1,387). Another study found most smallholder farmers faced severe constraints in terms of accessing the adequate irrigation funding and inputs, which results in low productivity and sustainability of the schemes (Nhundu and Mushunje, 2010). *'Farmers are able to produce for their own subsistence,*

for local markets if they are lucky' (see Box 4).⁴³ Zimbabwe's acute shortage of foreign currency has affected the costs of raw materials, which need to be procured from outside the country (ibid.). Along these lines, several interviewees noted that the macroeconomic crisis and hyperinflation that have affected Zimbabwe since the crisis of 2008 had had severe effects on irrigation and hence agricultural production. *'You cannot separate effects of economy/policy on production, all is entangled.'*⁴⁴

⁴³ Interview conducted in Harare on 1 March 2016 with representation of MAMID/DOI.

⁴⁴ Interview conducted in Harare on 1 March 2016 with representation of MAMID/DOI.

Box 4: A day in the field with Blessing

One of our interviewees, Blessing (fictitious name), who owned 2 ha of land outside of Harare, Zimbabwe's capital, shared with us the costs he incurred in his irrigated field on a yearly basis. His story is a good illustration of why irrigation is expensive in Zimbabwe, and of what factors hamper most small farmers from making a profit out of irrigation.

Blessing pays for:

- Annual fee for using a borehole: \$100.
- Costs of water: He uses less than 300 m³ per growing season – in one year, you use approximately 500 m³ (in the summer season, irrigation is supplementary).
- Electricity to run the pumps: \$250 for each growing season, hence \$500 per year.
- Fertiliser: This is the most expensive input – Blessing spends \$350 per year (each bag of fertiliser is \$35).
- Seeds: For potatoes, he pays \$300–500 (depending on the variety); he plants potatoes on three quarters of his land.
- Labour: Blessing has hired a full-time supervisor for his land because he lives in the city; he costs \$200 per month; he also gets casual labour in when he needs it, for example in the months of January and February. Each worker costs \$60 per month.
- Chemicals: Blessing also spends an average of \$56 on chemicals for weed and insect control.

This year, Blessing is expecting a harvest of 6–9 tons of potatoes and 7 tons of maize. He will keep the maize for his family and sell potatoes in the local market. He will make a total profit of \$9,000 per season. To put this number into perspective, the highest paid farm worker in Zimbabwe earns around \$130 per month (key interview). Blessing, therefore, says this is 'a good profit'. He would have made more money if he planted only potatoes instead of maize, but maize is less risky. He chooses the crops to plant based on the risks for production, not on market demand: *'If something goes wrong, you lose a lot of money.'*

'The good thing about irrigation is that it allows you to plan, and hence profit from the best market conditions. But irrigation is expensive. And many farmers especially in communal areas do not know about the market, they make a lot of losses.'

Source: Authors.

Scheme level

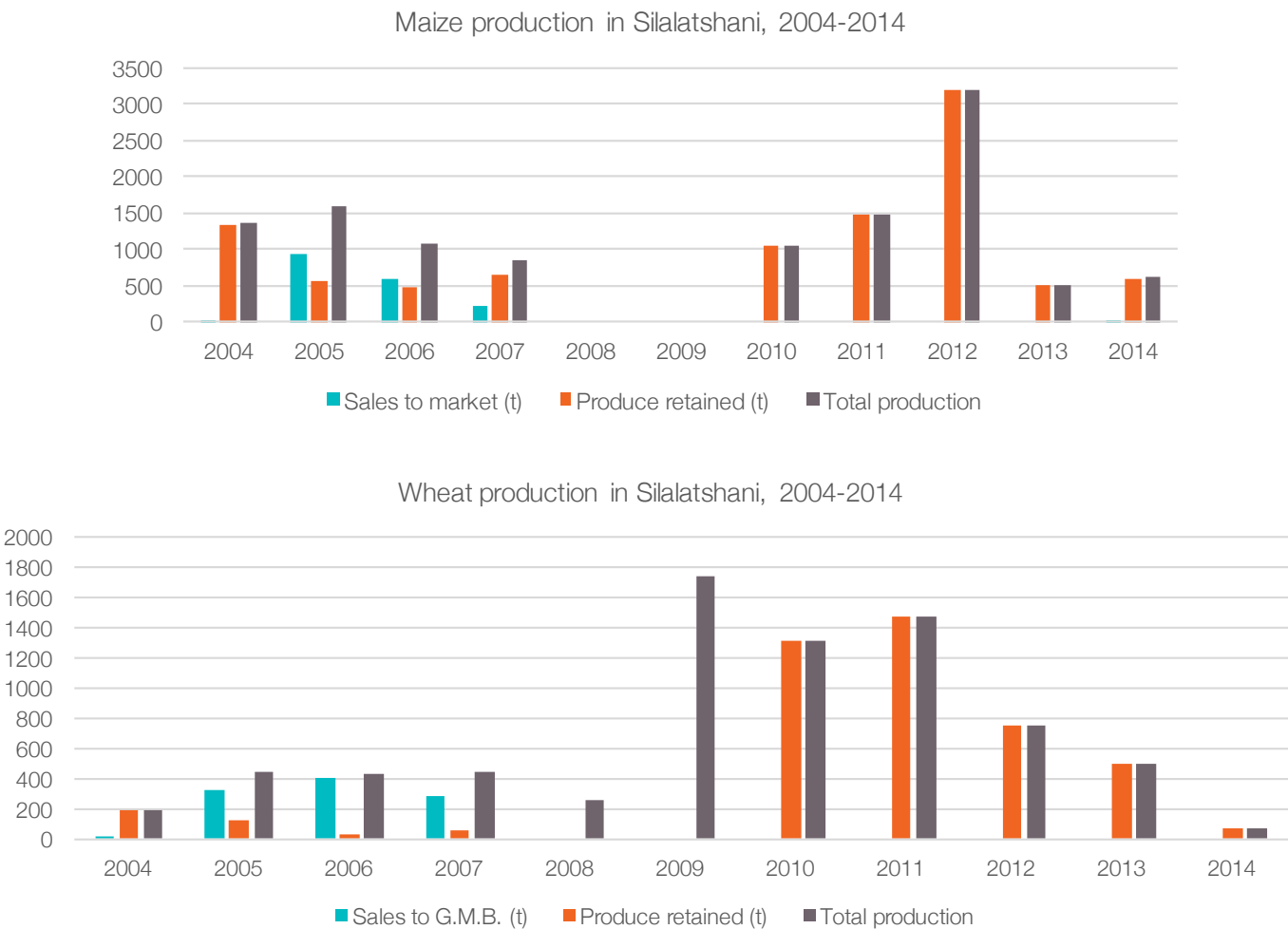
Several studies argue that smallholder irrigation schemes in Zimbabwe are characterised by low production, minimal contribution to the national economy and an inability to cover development and operation costs (Manzungu and van der Zaag, 1996; Mutambara and Munodawafa, 2014, in Moyo et al., 2016). These findings were

reflected in the two irrigation schemes of Mkoba and Silalatshani, where low production levels have been recorded for the past five years (see, e.g., crop figures for the Silalatshani scheme in Figure 4),⁴⁵

⁴⁵ According to Moyo et al. (2016), maize yields at Mkoba and Silalatshani averaged 300 kg/ha and 850 kg/ha, respectively; they were even lower for groundnuts (110 kg/ha at Mkoba and 220 kg/ha at Silalatshani).

giving farmers little chance of producing excess for sale, and even leaving most households (75% in Mkoba and 78% in Silalatshani) food insecure (Moyo et al., 2016). At scheme level, our analysis pointed to several factors negatively affecting agricultural productivity.

Figure 4: Data on productivity of the Silalatshani scheme



Source: Authors, using data from AGRITEX office, Insiza District (as of March 2016).

First and foremost, lack of investment in the maintenance of the irrigation schemes has caused infrastructure to fall in disrepair in many parts of the country. In the cases of the Silalatshani and Mkoba schemes, only 20% and 70% (respectively) of the irrigated land area is currently being used (Moyo et al., 2016). One reason for this is insecurity over land tenure, which discourages farmers from investing in infrastructure maintenance. The village chief in Mkoba explained, 'Farmers do not own the land, the state does; farmers receive the land from the IMC, which keeps a list of people applying for it, while I keep the land registry.'⁴⁶ Because GoZ owns the land, it is difficult for farmers to use it as a collateral to secure loans to invest in the schemes (ibid.). In addition, the land reform created situations where farmers were put together on lands sharing the same irrigation infrastructure; no one owns the infrastructure, and no one feels like investing resources into maintaining it. 'Where you had one farmer, now you have one hundred, on the same piece of land; obviously, irrigation design did not consider the demarcations enforced by the land reform, so now infrastructure is shared and people cannot agree on how to maintain it.'⁴⁷

As reported by Moyo et al. (2016), there is also some confusion over who manages irrigation infrastructure. Our interviewees with farmers and agricultural extensionists in the Silalatshani and Mkoba schemes confirmed this. Traditionally, infrastructure maintenance was the government's role, with no input from irrigators. However, after the 2000 land reform, infrastructure management became a joint responsibility of the government and irrigators; for example, in Mkoba, the

⁴⁶ Interview conducted in Mkoba on 9 March 2016.

⁴⁷ Interview conducted in Harare on 1 March 2016 with representation of MAMID/DOI.

government is responsible for the headworks whereas irrigators reported taking responsibility for the infield infrastructure.⁴⁸ Lack of maintenance results in dilapidated infrastructure, such as fences, which has led to problems with stray livestock invading the scheme and destroying crops; large conveyance losses between the dams and the fields also occur, as well as illegal abstraction of water from the water canal (Moyo et al., 2016; key interviews).⁴⁹

All respondents from GoZ and donors side confirmed that management models had an impact on schemes' productivity. In the past, several management models have been tried out, often supported or even introduced by external actors, such as FAO and the EU. For example, FAO focused on reinforcing managerial capacity in the scheme through extensionists. The Italian NGO Cesvi attempted to outsource the management of an irrigation scheme in the western part of the country to a steering committee, headed by a manager who could guide farmers towards realising a profit. But all these models reportedly encountered some difficulties; donors and the government alike continue struggling to identify the most appropriate management model to make irrigated agriculture in small-scale schemes commercially viable and profitable for farmers.⁵⁰ One interviewee from the African Development Bank (AfDB) said, 'The problem is farmers receive the land and all the equipment and inputs that are required to do irrigation by the government for free, they do not have a loan to repay, so their commitment to the scheme is low; and when the government cannot provide these resources,

⁴⁸ Interview conducted in Mkoba on 9 March 2016 with farmers in the irrigation scheme.

⁴⁹ Interviews with farmers in Silalatshani and Mkoba schemes, conducted in March 2016.

⁵⁰ Interview conducted in Harare on 3 March 2016 with EU representative.

farmers do not make enough profits and cannot access financial loans to invest in their proper business.'⁵¹

The lack of an irrigation policy for the country translates on the ground into unclear rules as to who should manage irrigation infrastructure, bear the costs for it and reap the benefits from it. 'Paradoxically, in Zimbabwe you have a situation in which farmers have the privilege – because irrigation is a privilege- of being on irrigated lands, but they do not nothing with them; and nobody can move them from there, that land is wasted.'⁵² This problem is compelled by the disconnect between national policies and actors and those at district/scheme/village level, where informal institutions such as the village chiefs still play a key political role that falls outside the control and authority of Harare. Government offices at provincial and district levels (e.g. AGRITEX) are also understaffed and underfunded, and IMCs' legality and authority remain unclear ('There is no policy that talks about the IMCs, they were created as committees but they have no legal standing').⁵³

Limited financial resources, owing to obstacles in accessing functioning markets, are another reason why farmers underinvest in the maintenance of irrigation infrastructure. Very few farmers actually see farming as a business; most use irrigation to cultivate maize, groundnuts, sugar beans and wheat for home consumption.⁵⁴ Farmers in both the Silalatshani and Mkoba schemes complained they could sell their products (mostly vegetables) only on local markets, where prices are

⁵¹ Interview conducted in Harare on 4 March 2016 with AfDB representative.

⁵² Interview conducted in Harare on 1 March 2016 with representation of MAMID/DOI.

⁵³ Interview conducted in Harare on 1 March 2016 with representation of MAMID/DOI.

⁵⁴ Interviews conducted in March 2016 with farmers at Silalatshani and Mkoba schemes.

‘very low’.⁵⁵ Most distant markets are inaccessible to smallholders because of the high transport costs and competition from other sellers, including those from neighbouring countries that have lower costs of production. AGRITEX officials and local government staff also commented that there was no planning of agricultural production at the scheme level, which reduces the competitiveness of farmers on markets (‘Every farmer produces what he/she wants on their 0.1 or 0.5 ha of land, using different quantities of fertilisers and chemicals, which means the products that come out of the scheme are of varied quality, and they can sell only on local markets’).⁵⁶

⁵⁵ According to Moyo et al. (2016), the most lucrative crops were groundnuts (\$8/kg at Mkoba) and sugar beans (\$2/kg at both schemes).
⁵⁶ Interview conducted in Bulawayo on 6 March 2016 with AGRITEX representative.

Lack of access to finance was another issue raised by farmers and other respondents at scheme level. Because farmers do not own the land, banks do not lend them money; when they do so, they agree only on short-term/seasonal loans with very high interest rates (up to 18% per year, according to a respondent from MAMID).⁵⁷ Without profits and/or loans, farmers cannot procure the inputs they need for growing their irrigated crops; farmers in Mkoba and Silalatshani particularly complained about the unaffordability of fertilisers and energy, and often also water.
In Silalatshani and Mkoba, ZINWA supplies water, but, because there are no meters at the point of abstraction, prices are based on area covered. The many conveyance losses on the

⁵⁷ Interview conducted in Harare on 1 March 2016 with representation of MAMID/DOI.

network,⁵⁸ and the fact that not all the land is generally cultivated, mean farmers pay for more than they consume. Farmers complain very vocally to ZINWA about this, through the IMCs and village chiefs. One representative of ZINWA acknowledged the problem but noted that they had not come up with a solution to solve these conflicts. ‘Some farmers are right; in this case, we accept that they do not pay or we delay their payment, but this affects our budget and hence capacity to operate.’⁵⁹

Table 6 presents a summary of the bottlenecks to agricultural productivity.

⁵⁸ Based on observations during field visits, Moyo et al. (2016) estimated that the Silalatshani scheme may be losing up to 50% of the water during conveyance. The water canals are also leaking, and the night storage dam valves are not functional, leading to water losses.
⁵⁹ Interview conducted in Harare on 2 March 2016.

Table 6: Factors influencing irrigation performance in Zimbabwe

Governance level	Influencing factor	Barriers
External	Donors/IFIs	No loans/long-term development aid to Zimbabwe after land reform and owing to debt arrears, only engaged in humanitarian interventions.
	World markets	Sanctions and economic collapse of period 2000–08 basically excluded Zimbabwe from international markets. Dollarisation of economy in 2009 reduced competitiveness of Zimbabwe's produce on regional/international markets.
	Climate and environment	Arid and semi-arid conditions in most of the country; climate change and variability expected to worsen. El Niño drought of this year slowed agricultural and economic recovery of past years.
National level	Agricultural policy (and ideology)	Focus on food security at the expense of economic growth; irrigation becomes for subsistence, but has little financial viability. Strong interventionist stance of the state in agriculture (provision of subsidies for grain).
	Land rights	Land reforms affected agricultural productivity; dismantlement of white farmers led to loss of expertise/capacity, unclear rules/responsibilities for operation and maintenance of the schemes and reduced maintenance and hence decay of schemes. Consequences also in terms of lack of access of farmers to loans and hence inputs.
	Institutions	No irrigation policy has translated into lack of 'vision' for the sector; <i>ad hoc</i> interventions reacting to political and economic conditions, not towards clearly defined objectives. Weak formal institutions at subnational level – conflicts with traditional institutions.
Subnational level	Demand for water	Water scarcity – physically induced, but also increasingly human-induced; some instances of conflict when same water source shared among different uses/users. Water expensive, farmers do not pay fees (conflicts with ZINWA).
	Urban growth and markets	Farmers have reduced access to markets: low prices (set by 'middlemen'), high costs of transportation, not homogeneous quality of produce, competition from cheaper products from neighbouring countries.
Scheme level	Technology	Limited spread of water-efficient technologies. When introduced, farmers often cannot use them for lack of capacity and not enough electricity, e.g. for sprinkler irrigation.
	Finance and technical capacity	Lack of access to financial resources (banks are reluctant to give loans to farmers and small profits from irrigation). Technical capacity also low – extensionist service is under-staffed and trainings are outdated.
	Social benefits	Difficult to transfer benefits from irrigation to wider society; female-headed households are more vulnerable owing to lack of land ownership and access to inputs (credit, extension services) (see Box 5).

Source: Authors.

4.3 Trade-offs: assessing costs and benefits of irrigation

Irrigation is often portrayed as the ‘magic wand’ to increase farmers’ food security and climate resilience, reduce poverty and ultimately stimulate the economic growth of the country and so benefit everyone. This assumes irrigation automatically increases agricultural production. We have discussed above why this is often not the case, based on the story of Zimbabwe and its two small-scale irrigation schemes of Silalatshani and Mkoba.

As irrigation results in the reallocation of land, water and financial resources to some at the expense of others, the success of irrigation investments and projects should be assessed based on who wins and loses from them. In turn, this judgement should be made against the different objectives they have been set to achieve: food security, poverty reduction, economic growth, climate resilience. The need to understand winners and losers emerges very clearly in the case of Zimbabwe, where the irrigation discourse has been, perhaps more strongly than in other countries, inextricably linked to questions of equity and justice, exclusion and discrimination.

In Zimbabwe, the discourse on irrigation has typically focused on benefiting smallholder farmers. In reality, small-scale irrigation schemes were put there so poor farmers could at least engage in subsistence agriculture, whereas productive lands were kept for a small elite that benefited from the profit of commercial agriculture.

Even with the land reform, the redistribution of these lands was not carried out on the basis of principles of equity, but rather to

meet the demands of another small elite, politically tied with the ZANU-PF. In other words, irrigation has been a political instrument, more than an effective tool to improve the livelihoods of farmers.

In general, our respondents shared the perception that irrigation did bring some benefits to farmers, especially in terms of boosting their resilience to climate shocks. *‘This year [of drought] those farmers in the irrigation schemes have at least been able to feed their families; those outside the schemes are starving.’*⁶⁰ However, investments in irrigation have not been matched with investments aimed at raising non-irrigators from poverty. In some cases, respondents argued, irrigation was benefiting also those farmers living in proximity of the schemes, as they could be hired for seasonal work.⁶¹ In others, farmers living near irrigation schemes reportedly felt most assets and investments went to the benefit only of irrigators. On these grounds, for example, they opposed projects on micro-catchment management and conservation initiated by international organisations with the aim of upgrading irrigation schemes. In addition to benefiting irrigators more, these projects would have taken out land from productive uses thereby leaving marginal farmers even worse off.⁶² At present, these claims are purely based on anecdotal evidence; income data should be collected and analysed to understand the societal impact of irrigation.

Paradoxically, those farmers in schemes that have introduced

more water-efficient technologies, and would therefore suffer less from expensive water, suffer from the high costs of electricity instead. Electricity is very expensive in Zimbabwe, and often unreliable. This means not only that farmers cannot afford to pay their electricity bills but also that power cuts often affect water supply at critical stages of crop growth.⁶³ As of March 2016, Zimbabwe’s power utility Zesa Holdings reported it was owed \$80 million by farmers, most of it for irrigated crops such as wheat and tobacco. Farmers were pushing back against Zesa’s plan to install pre-paid meters on farms, arguing that this would kill production as they could pay for electricity only at the end of the season, when they sold their produce. No solution has yet been put on the table to solve these conflicts.⁶⁴

GoZ’s attempts to address some of these gaps are not delivering the envisaged benefits, either. Technology transfer programmes to bring in more efficient irrigation technologies have been accused of benefiting more foreign companies than farmers, as in the case of the More for Food Programme.⁶⁵ Donors’ interventions and projects are obviously limited in terms of the amount of farmers and communities they can target (generally focusing only on ‘pockets’ of communal areas in dry areas of the country), and sustainability is hampered by short project timeframes.⁶⁶

⁶³ Interviews conducted in the Silalatshani and Mkoba irrigation schemes in March 2016 with farmers.

⁶⁴ Information from key interviews, and from Chikono (2016).

⁶⁵ Interviews conducted in Harare and in the provinces in March 2016 with MAMID representatives.

⁶⁶ Interviews conducted in Harare in March 2016 with donors (EU, FAO).

⁶⁰ Interview conducted in Harare on 11 March 2016 with representative of FAO.

⁶¹ Interviews conducted in Harare and in the Silalatshani and Mkoba irrigation schemes in March 2016.

⁶² Interview conducted in Harare on 11 March 2016 with representative of FAO.

Box 5: Women and irrigation in Zimbabwe

In Zimbabwe, traditionally women do not inherit land. As a consequence, widows without an adult son in line to inherit may face the risk of losing their land and other assets to their husband's family (Busse, 2006). During the FTLRP of 2000, land was allocated unevenly to men and women. In most cases, it was men whose name appeared on the 'offer letters', or the permits issued by GoZ to the new settlers. A 2011 study reported that only 12% of households had a woman named as the landholder, and these were mostly concentrated in informal settlements, as women had moved there to escape abusive relationships or accusations of witchcraft, for example. In most irrigation schemes, women are employed as labour – often through casual, low-paid arrangements (Scoones et al., 2011).

A survey indicated that irrigation in smallholder schemes in Zimbabwe is dominated by women, although few are represented in their IMCs, which comprise 80% men (Mutambara and Munodawafa, 2014). An average household in Zimbabwe has more females (5.64) than males (3.44), as men temporarily migrate to towns where job opportunities are better while women remain in the scheme and oversee the irrigation works at the farm. For example, at Mkoba irrigation scheme, irrigators were predominantly female as men worked in the nearby town of Gweru (Moyo et al., 2016). Nevertheless, female-headed households were found to be particularly vulnerable: they hold less land, produce lower crop yields and own fewer heads of livestock, and are often excluded from access to services such as extension services, credit or education (Huisman, 2003, in Busse, 2006). In addition, because women have to look after children as well as other vulnerable groups in the community, such as orphans and chronically ill persons, they have less time to dedicate to irrigation development, which negatively impacts the viability of irrigation schemes (Mutambara and Munodawafa, 2014).

Source: Authors.

4.4 Irrigation for climate resilience?

Irrigation has often been portrayed as a way to mitigate against the impacts of climate variability and change, and to increase the resilience of farmers to climate shocks. We wanted to see whether this was actually the case in Zimbabwe, and under what conditions.

A first observation from our analysis is that irrigation is itself vulnerable to climate change and variability, especially in the form of droughts (see Section 3.1.1). Most interviewees, especially at the scheme level, agreed, '*Water scarcity is the biggest challenge Zimbabwe is facing.*' Although perceptions may have been exacerbated by the current drought, it is undeniable that especially the driest areas of Zimbabwe suffer from a physical limitation of water, exacerbated by the lack of functional infrastructure to harness its potential for productive uses.

*'Everyone [IFAD, FAO, EU] comes to Zimbabwe for irrigation, and yes we need irrigation, but climate change risks making all these investments fail – irrigation schemes do not function without water.'*⁶⁷

The impacts of climate extremes are also affecting farmers' capacity to invest in inputs and maintenance in the irrigation schemes, in turn affecting their productivity and disrupting farmers' livelihoods. In the Mkoba scheme, some farmers were part-time irrigators, who had land outside the scheme for subsistence farming while also producing vegetable cash crops in the irrigated areas. The two productions are related: if farmers have a surplus of maize, they will sell it and buy inputs for irrigated crops, which have a higher market value; these profits can be invested in education, health, etc. The current drought, hitting particularly

rain-fed farming, has also reduced the surplus farmers can reinvest in irrigation. Many irrigation schemes are currently cultivated with maize for subsistence. This can break the productive cycle and income of households for years, bringing even the relatively better-off farmers back to poverty.⁶⁸ Therefore, rain-fed and irrigation agricultural systems are closely linked (one is not a complete replacement for the other). Irrigation interventions do not adequately account for these linkages that are key to livelihoods, being fixated on the scheme itself (and usually the engineering/hardware part).

Irrigation development is portrayed as key to bring the country out of the current drought situation and enhance farmers' resilience to future climate shocks. The government's discourse has centred on the vulnerability of rain-fed agriculture to drought

⁶⁷ Interviews conducted in Harare in March 2016 with researcher.

⁶⁸ Interview conducted in Harare on 10 March 2016 with representative of United Nations Development Programme (UNDP).

conditions to justify and catalyse investments in irrigation. At present, given limited state finances and foreign investments, the GoZ discourse focuses on rehabilitating some existing schemes, particularly in NR IV and V. The long-term plan, as laid out in the Zim Asset strategy, is to increase the area under irrigation. The current drought has also renewed the interest of bilateral and multilateral donors in irrigation, especially in the most vulnerable areas, such as drought-hit Masvingo province, moving them out of their current 'humanitarian response' mode into more development-type aid that also looks at irrigation infrastructure rehabilitation and development.⁶⁹ The partial clearing of Zimbabwe's arrear debts under the Lima Agreement of February 2015 has also allowed IFIs to restart lending money to Zimbabwe.

However, several observers noted that, if concerns over climate change impacts did lead to an expansion of irrigation, as would seem to be the case in Zimbabwe, water demand would increase, too (see, e.g., Moyo et al., 2016). Without the appropriate set of institutions for managing water allocations and uses, conflicts between uses and users could emerge or be exacerbated.

Several bottlenecks also persist that hinder irrigation delivering on the objective of climate resilience for smallholder farmers, as well as for the country as whole. First of all, water-efficient technologies remain poorly spread in the country. Most farmers still use canal irrigation, which is vulnerable to climate-induced water scarcity. Those farmers who have adopted water-saving technologies, such as sprinkler and drip irrigation, are not necessarily better off, because these require electricity, which is

*'highly unreliable and expensive in Zimbabwe', according to interviewees in the government as well as in the irrigation schemes. The More for Food Programme has been criticised precisely on these bases. Pressurised irrigation technologies can be counter-productive if there is no electricity, and no accessible and affordable market for the spare parts. 'In the long term, this technology will inevitably stop working; small farmers are actually better off with canal irrigation, with minimal maintenance and energy requirements.'*⁷⁰

Our analysis also highlighted that building the resilience of farmers to climate shocks does not mean only increasing their agricultural productivity. Farmers are concerned with food security, but to them resilience also means being able to continue sending their children to school or affording health care. Therefore, climate resilience necessitates interventions that combine irrigation with access to markets, to additional and complementary non-farm income sources and to other sources of livelihoods, such as livestock. In particular, livestock provides flexibility to irrigators, as animals can be sold to offset losses in crop production and to provide a food source during critical periods, and are a form of saving. Especially donors and INGOs recognised the need for the discourse and investments/programmes on irrigation to work in synergy with other sectors, for example nutrition, education, health. Some attempts have started in this sense. For example, CARE International has invested in programmes that link small-scale irrigation and livestock, to improve nutrition levels among communities the dry Manicaland province.⁷¹ Zimbabwe's Agricultural Research Centre is also piloting

some programmes trying to leverage the links between irrigated crops and livestock. *'The government has started taking livestock seriously in the past tow years [in concomitance with the drought]; MAMID has appointed one deputy director for livestock, and one policy on livestock is waiting for approval.'*⁷²

⁶⁹ Interviews conducted in Harare in March 2016 with representatives of donors and international organisations (EU, SDC, SNV, CARE International).

⁷⁰ Interview conducted in Harare on 3 March 2016 with representative of FAO.

⁷¹ Interview conducted in Harare on 3 March 2016 with representative of CARE International.

⁷² Interview conducted in Harare in March 2016.

5. Conclusions and recommendations

5.1 In summary

This review has highlighted the need to understand drivers of change in irrigation policy/discourse and practice to explain current problems and hence find solutions that contribute to economic growth and poverty reduction, as well as climate resilience. It has stressed the importance of embedding irrigation in the broader political and socioeconomic and cultural context of a country throughout history in order to make sense of present practices and future development trajectories.

Zimbabwe is a useful example of why this is needed – its political and economic destiny, and eventually that of its people, has inextricably been linked to the question of land. Land has been the source of past and current wrongs, violence, exclusion; therefore, it makes sense to start from the land to bring about change that delivers on the goals of food security and poverty reduction (in a country where 72% of people live below the national poverty line and 2.8 million are food insecure), economic growth (in a country that has shown immense potential to be a strong regional player in the past) and climate resilience (in a country that has been, is being and will be profoundly affected by climate variability and change).

The current drought in Zimbabwe emphasises how these outcomes are interconnected; climate change cuts across them, and exacerbates existing problems. Drought has made people food insecure, leading to higher poverty levels and in turn undermining the country's economic growth. This pattern is true not only for Zimbabwe but also in all Southern Africa. Irrigation has often been presented as a 'silver bullet' solution allowing farmers, and eventually the economy, to

withstand the impacts of climate change. Our study highlights that this is true only under certain conditions, thus calling for a better understanding of the bottlenecks that exist in the current irrigation system and that hinder its capacity to deliver on its promises. In the case of Zimbabwe, we have identified the following:

- At the international level, donors and international financial institutions suspended loans and long-term development aid to Zimbabwe after the controversial land reform and because of the country's debt arrears. The concentration of their support in short-term humanitarian interventions has not allowed them to invest in irrigation infrastructure and management. The international sanctions that have been imposed on Zimbabwe since 2000 have excluded the country from international markets. Together with the dollarisation of the economy of 2009, this has reduced Zimbabwe's competitiveness on regional and international markets.
- At the national level, the main bottleneck is the lack of irrigation policy, which has translated into lack of 'vision' for the sector. Interventions and investments in irrigation have been ad hoc, reacting to economic and political conditions rather than responding to clearly defined objectives. In addition, the prevalent discourse on irrigation has focused on food security at the expense of economic growth. GoZ has maintained a strong interventionist stance in agriculture, keeping irrigation as a strategy for ensuring the subsistence of farmers rather

than making it financially viable and hence an activity benefiting the broader economy. The land reforms of 2000 have also affected agricultural productivity by severely contributing to the decay of irrigation schemes and hindering farmers' access to loans for inputs.

- At the scheme level, our case study reveals that lack of appropriate management models and insecure land tenure regimes have resulted in inadequate investments in the maintenance. Farmers do irrigation for subsistence, not as a business; they lack access to markets, finance, inputs; extension services are inadequate to respond to the many challenges they face.

It is also important to understand who wins and who loses from irrigation. Although smallholder farmers have been portrayed as the main beneficiaries of irrigation, this has not necessarily been the case in Zimbabwe. The irrigation discourse masks exclusion patterns, and in reality remains shaped around the interests of few. Irrigators are still better off than non-irrigators (especially in the context of the current drought), but this can raise issues of equity within communities and people living in the same region. In the absence of appropriate mechanisms to guarantee access to markets and regulatory tools to ensure prices are to the advantage of farmers, markets benefit 'middlemen' more than farmers.

Our analysis also highlights that irrigation is also vulnerable to climate change. A blind focus on 'irrigation expansion' as a solution to the impacts of climate change may be dangerous as it risks leading to conflicts, if not

appropriately managed, and may even leave some people worse off in the absence of social safety nets. Overall, our review confirms that irrigation needs to be understood in the broader social, cultural, economic and political context of a country – and in relation to all the benefits it is supposed to provide: climate resilience, poverty reduction and economic growth.

5.2 Future pathways for irrigation policy and practice

Improving performance in the irrigation sector will require a range of solutions at different scales. While some of these will be technical or managerial in nature, many relate to the political or institutional environment and are likely to be more challenging to implement.

Managing water across scales and sectors (taking land issues into account)

In water-scarce basins, irrigation schemes pose a risk to other water users, and are themselves vulnerable to water shortages. Hence investments in expanding the irrigation sector need to be coupled with measures to allocate water effectively and equitably, and to monitor use, particularly in light of future climate change. This will inevitably involve trade-offs, which need to be negotiated based on agreed and shared development priorities, and dealt with transparently in order to avoid elite capture. The case of Zimbabwe also demonstrates that water management is inevitably linked to land management. Therefore, efforts at reforming water management practices must follow the establishment of a fair and secure land tenure system and rights.

The current model – IWRM implemented through a series of nested institutions – is not working as it was conceived to in Zimbabwe (nor in many other countries where

these reforms have been attempted). The new institutions that have been established at catchment and sub-catchment levels tend to be dominated by the interests of ‘more powerful’ stakeholders, such as commercial farmers, without taking into account the interests of smaller farmers and other stakeholders. Revising current land management and tenure arrangements to give farmers secure land ownership rights may give them more incentives to invest in measures to increase agricultural productivity. On the other hand, as the case of Zimbabwe shows, the mandates of these ‘new’ institutions can overlap with those of local authorities, such as village chiefs, leading to confusion and disputes over who is in charge of allocating how much water to whom.

A critical step to identifying solutions is to establish shared understandings of water management practices, problems and goals. This can happen at ministerial level, entailing better communication between sectors, but also at the local scale, bringing together different water user groups around a specific set of issues. Another important step at sector level, to cope with the uncertainties around water supply and demand, is to ensure investments are designed with flexibility to respond to changing circumstances. Related to this, there is a need to move away from simplistic understandings of irrigation efficiency and to consider how efforts to increase ‘crop per drop’ at scheme level might affect basin-level equity. There is a big opportunity to change mind-sets, but this has to be done through participatory research and testing methods together with the relevant government experts. In the case of Zimbabwe, for example, AGRITEX technicians have often played the intermediary role between farmers, and state and traditional institutions. If provided with the required

resources and knowledge, they could be viable entry points for facilitating this dialogue.

Attention to local institutions

Attention to irrigator institutions is highlighted as a significant gap in current approaches to sector development in Zimbabwe. Establishing new structures for water management (which also encompass other functions such as fund generation and management) takes time and can be particularly challenging in contexts where irrigation is new and there are few existing arrangements to build on.

Blueprint approaches to institutional design are also unlikely to work, given the diversity of socio-cultural contexts. Moreover, ‘new’ institutions, while less prone to the risk of being captured to serve the interests of local elites, can conflict with traditional/customary ones that have been in place for longer and are accepted and respected by the people. Clear roles and responsibilities, eventually enshrined in policies and strategies, and reflected in the mandate and resources of local-level institutions, are needed. Responsible ministries at the national level have a key role to play in this sense, as well as in providing institutions with the resources (and especially funding and personnel) they need to perform their role. Social learning approaches can be a useful alternative to build the capacity of farmers and local government staff alike, but require long-term investment. Such an approach entails cycles of knowledge-sharing and joint action to co-create information, institutions and practices. Clearly, this is not a job suited to engineers alone! In addition to financial resources, there is a need to recruit the relevant expertise to facilitate such processes. Donors can provide support in this sense by introducing and/or reinforcing the learning and capacity-building components of their irrigation programmes with

small-scale farmers and local governments in Zimbabwe.

Irrigation must be profitable

Unless the state is able (in addition to being willing) to continue subsidising repairs and rehabilitation, irrigation must do more than meet farmers' subsistence needs. Irrigation is an expensive business, and will be sustainable only if it is financially viable. Moreover, farmers are unlikely to see the value of investing in managing and maintaining infrastructure unless they make a profit – this is an important incentive for collective action (albeit not the only one). Currently, production costs are relatively high when compared with market prices, and so are the risks of investing, given the unreliability of markets. Improving transport, storage and processing, and market information systems, alongside policies to regulate market and input prices, will be necessary to make irrigation viable for smallholder farmers. As the case of Zimbabwe shows, such investments will also benefit rain-fed producers.

Ensuring that benefits reach the poor and marginalised

In the rush to build new infrastructure and rehabilitate existing schemes, questions about the targeting of investments have been somewhat side-lined. High-profile initiatives have tended to target districts that already have high potential; also, donors prefer focusing on areas where their presence is well established and where they can be sure their

investments result in positive outcomes. This means less public money goes towards semi-arid areas where populations are highly vulnerable to drought. At the local level, investments have often been influenced by political concerns and patronage networks. Instead, investments should be based on assessments of agro-ecological conditions, resource availability and people's needs (women and men, different age groups, different occupations, different social classes, etc.). In the political and social context of Zimbabwe, agricultural extensions may be best positioned to conduct this kind of assessments, provided they are provided with the appropriate capacities and resources to do so. Communication channels and reporting structures need to be established and reinforced to ensure these needs feed into planning and funding allocation from central government (at provincial or national level).

Such assessments are also crucial to ensure increased productivity and resilience can benefit everyone. Evidence from the case of Zimbabwe suggests irrigators are generally better off than other farmers, especially in times of drought. This raises question about who these irrigating farmers are – for instance, they may be the ones with better political connections and power resources. Lack of access to land and other capital is often a barrier for poor or marginalised groups, including women, in terms of participating in

irrigated production. While irrigation investments can have spill-over effects for the local economy, certain groups inevitably lose out. For example, use of land and water for irrigation may foreclose activities such as livestock-keeping. More research is needed to understand the nature of these effects and trade-offs, and how more equitable outcomes might be achieved. This, in turn, is crucial for tackling extreme poverty.

Irrigation is not the only answer

To conclude, irrigation technologies are not the only answer to increasing productivity, raising rural incomes or achieving growth in the agriculture sector. Nor is irrigation expansion a sure win for climate resilience. Investments are also needed in agricultural value chains, water resources management and enabling institutions. Perhaps this is obvious. Yet current initiatives have failed to learn many of the lessons of past experience.

One way in which policy-makers could be better held to account for their decisions is through performance monitoring. Success cannot be measured just in terms of canals lined or weirs built. There is a need for a clear framework to evaluate performance outcomes at both scheme and sector level. In assessing livelihood benefits and the sector's contribution to national policy objectives, more sensible decisions can be regarding future investments.

References

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Appendix 1

List of interviews

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Appendix 2

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Appendix 1: List of interviews

Organisation
University of KwaZulu-Natal
SDC
DOI/MAMID
FAO
ZINWA
MAMID, Department of Research and Specialist Services, Division of Livestock
Zimbabwe National Farmers' Union
MEWC, Department of Climate Change Management
EU
CARE International, SEAD Programme
UNDP
MAMID, Department of Research and Specialist Services, Division of Crops Research
AfDB
SNV
AGRITEX Bulawayo
ICRISAT
AGRITEX DA
Insiza district
Silalatshani Irrigation Scheme Management Committee
Insiza Rural District Council
Mkoba Irrigation Scheme
MAMID/DOI, Midlands province
AGRITEX, Midlands province
UNDP, GEF Small Grants Programme
FAO
MAMID, Policy, Planning and Projects Management
MAMID, Economics and Markets Department

Appendix 2: Interview questions

In Harare: National-level interviews with ministries, AGRITEX, NGOs/INGOs/donors, private investors – to understand evolution of political discourse and governance framework for irrigation

Contextual info:

- Main objectives/priorities (discourses and policies), including historical evolution looking at the past 30–40 years (before and after independence); entangle this with land (especially!)/water rights discourse and policy – very relevant for Zimbabwe!
- Prevailing discourse on climate change adaptation/resilience: how is the discourse framed (e.g. climate change = drought = threat to food security?), who is pushing this discourse in particular (e.g. donors, or ministries or NGOs?), with what consequences in terms of prioritisation of investments (does it affect investments at all)?
- Trade-offs between different water users: How important is irrigation? Instances of water scarcity (physical or use-induced?) Conflict/competition over water resources, and between what users (sectors? Upstream/downstream? National vs. regional? Large vs. small-scale farmers?)
- Main actors in irrigation (interests, incentives, power, relations). How has the evolution of roles and responsibilities reflected the priority given to irrigation (e.g. is there/has there ever been a ministry in charge of irrigation, or have tasks been divided among different ministries, how powerful is MAMID/DOI?) Also look at role of donors, private investors, political affiliations (role of ZANU-PF). Clarify roles and responsibilities.
- Degree of participation of farmers (participatory processes embedded in policy/legislation in agriculture sector?)
- Economic and financial drivers/incentives: Who have been and are the main investors (and how have they changed, e.g. non-traditional donors? How substantial are irrigation investments compared to other sectors?)
- Technologies: which ones are supported/used/promoted?

For MAMID (DOI, economics and markets), AGRITEX, IFIs and donors:

- Area equipped for irrigation: How much? Was it more in the past (evidence and reasons of its decline over time)? Can it be more in the future? If yes, what are the policies/technologies/investments available to promote irrigation expansion? If not, what are the factors constraining irrigation expansion in Zimbabwe?
- At national level what are the priorities for agricultural production in Zimbabwe? What crops, in what areas, for what purpose (staple food/commercial agriculture, etc.?) Generally speaking, has agriculture production increased/reduced over the past years in Zimbabwe? What have the main problems been?
- Do you have evidence that irrigation has significantly improved income/wealth on farmers over time? (Good to have examples from different regions and different types of irrigation schemes A1 and A2.)
- Is irrigated agricultural production connected to markets (and what agricultural markets in particular? Tobacco/horticulture/cotton?) Can farmers receive and respond to market signals? If not, what are the main constraints they face?
- What are the rules for the operation and maintenance of irrigation schemes? What are the main constraints (for different types of scheme)?
- Ask about irrigation policy/new agricultural strategy.

For MEWC, Environment Authority, MAMID (especially experts on climate change and AGRITEX), IFIs/donors/NGOs)

- (In your view/in the view of your organisation) Is the agriculture sector in Zimbabwe vulnerable to extreme event impacts (which ones)? Who are the most vulnerable to extreme events/climate change impacts? (Provide examples of vulnerability.)
- Are drought/flood early warning systems in place/effective? (Provide examples of how these work, especially with reference to current drought.)
- What adaptation measures have been taken to mitigate the impact of droughts/floods on the agricultural sector (e.g. changed crops, more storage built, irrigation developed, etc.)?
- Ask about climate change strategy: Has it been approved? What is its main focus (does it mention irrigation at all)? What ministry/department will be in charge of implementing it? Who will fund its implementation (and where does the money come from)?
- Is climate resilience conceived together with reduction? How (as a strategy/precondition for)?

For ZINWA, MAMID and other sectorial ministries:

- Is there evidence of increasing water scarcity in Zimbabwe? If so, what do you think its causes are (climate change, over-extraction, etc.)? How/where does it manifest? With what consequences for whom?
- How are decisions over water allocations made (e.g. are participatory processes in place)? By whom, according to what criteria? Are they informed by data/information on hydrology/water availability/climate/socio-economic variables, including scenarios?
- (In instances of water scarcity) What water uses are prioritised? (By policy/law, in practice?)
- Are water abstractions monitored accurately? If so, how/by whom? If not, why/what are the main constraints?
- How are decisions over water investments (including irrigation schemes) made? By whom, according to what criteria/for what objectives? With what funding?
- What is the budget for irrigation nationally? How is it divided between administrative regions and who manages it?

For irrigation experts:

- Evolution of irrigation policy in Zimbabwe: Overview and key institutional reforms (and linkages with land/agriculture and water policy).
- What type of irrigation schemes have been privileged in Zimbabwe (and why)? How have they performed (one type better than others and why?), to the benefit of whom (in theory and practice)? Who have been and are the main investors in irrigation? (National? International/donors?)
- Bottlenecks hindering performance of irrigation schemes (technical or political, or both?)
- What is the current discourse on irrigation in Zimbabwe? Is it still being pushed by the government? (What type, for what crops, linked to climate resilience/poverty reduction discourse?) Role of foreign investors (e.g. Chinese and Indian. Others?)

At scheme level: Interviews at local level with scheme managers, farmers, regional/provincial government authorities (if relevant)

(Understand evolution of political discourse and impact on outcomes through technical performance of the scheme.)

Contextual info:

- History of the scheme: Establishment and first objectives/initial planning process – evolution through time (through colonisation and decolonisation, communist-type management, liberalisation wave of the 1990s, etc.)

- What are the main objectives of irrigation policy/strategy in the scheme? At what level are they decided? To respond to what demand/need/broader strategy/objective? How have these objectives evolved throughout time (if at all) and why?
- How has the management of the scheme evolved throughout time? To what extent are farmers participating in the management of the scheme/decision-making over resource allocation in the scheme and off-farm?
- What are the implications of current policy and institutional arrangements governing water, irrigation and agriculture on agricultural productivity and food security for different farmers in the scheme?
- Main funders: Where does the budget come from (national/local authorities as a consequence of decentralisation process/international donors)? Who manages the budget (is the management system effective, i.e. does it allow allocating the budget to respond to the objectives/strategy set)?
- What are the main challenges that the scheme has faced over time (climate events, infrastructure degradation, marginalisation from markets, etc.) How have they been addressed/solved?

Other questions (based on draft indicators):

- *Water supply: Water availability (scheme level and in relation to farmers' needs); reliability; flexibility; equity of access.*
- *Access to key inputs/services:* Fertilisers; pesticides, seeds; farming tools, technical assistance; markets (transport links, crop prices).
- *Management:* Monitoring capacity; ability to allocate and schedule water in a responsive way (to farmers' needs); ability to enforce rules; ability to maintain infrastructure; response capacity; farmers' satisfaction.
 - Is there evidence that the network has unmet rehabilitation and upgrading needs?
 - Is there evidence that scheme operators/ farmers lack capacities or resources to manage and maintain scheme?
 - Is there evidence that supply disruptions owing to poor maintenance impact on production?
- *Finance:* Water user fees (rates, willingness to pay); transparency, management of funds; self-sufficiency/cost recovery (e.g. ability to meet O&M costs).
 - Is there evidence of problems in revenue collection (e.g. low coverage)?
 - Is financial management of the scheme not transparent?
 - Is there evidence that subscriptions do not meet O&M costs?
- Get data on *outputs:* Command area/yields (ha), total productivity, water productivity.
 - Is there evidence the area equipped for irrigation is less than the scheme design?
- Is the area under irrigation significantly less than the area equipped for irrigation?
- Is there evidence that the area under irrigation has declined steadily over time?
 - Is there evidence that yields have declined?
 - Is there evidence of soil degradation, including salinisation?
 - Is there evidence of unmet water demand, e.g. intra-scheme water conflicts or supplementary irrigation?
- *Impact* (growth, sustainability, equity):
 - *Social/equity:* Equity of benefit distribution; food security/nutrition; poverty reduction.
 - ✓ Is there evidence that the scheme does not have a policy for equitable water allocation between farmers?
 - ✓ Is design/infrastructure likely to result in unequal distribution?
 - ✓ Is there evidence of unequal water distribution?
 - *Economic:* Employment; profits/crops sales; other livelihoods benefits (e.g. fodder for livestock).

- ✓ Is there no evidence that the scheme has significantly improved income/wealth of on-scheme farmers over time?
- ✓ Does the scheme design constrain agricultural or water productivity?
- ✓ Is there evidence that farmers have constraints in receiving/responding to market signals, e.g. shifting to higher value crops?
- *Sustainability:*
 - ✓ Is the scheme vulnerable to extreme event impacts on water supply or infrastructure?
 - ✓ Are crop choices not drought-tolerant? (e.g. high water requirements, long growing seasons, low flexibility – perennial crops/orchard crops?)
 - ✓ Is there evidence of increasing water scarcity? (e.g. declining groundwater levels, reduced blue water flows?)

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Research for climate-resilient futures

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