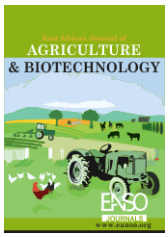

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Original Article

Can Locally Developed Institutions Promote the Management of Farmer Led Irrigation Development? Lessons from Nyando Sub County, Western Kenya

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Farmer Led Irrigation Development, Institutions, Institutional Bricolage, Water Management, Nyando Sub County.

ABSTRACT

Institutions are considered crucial for any irrigation enterprise to thrive, this is because they enable ordered thought and provide a framework for how irrigation will be carried out. The past decade has shown an intensification in irrigation development in Kenya with the government seeking to expand the area under irrigation. However, this expansion is expected to take place in the mainstream irrigation forms recognized by the government. Farmer Led Irrigation Development (FLID) is an alternative form of irrigation that is growing significantly and is already contributing to the area under irrigation and yet remains unacknowledged by policymakers. In FLID, farmers oversee their irrigation enterprise making decisions on the how, the what, the where, and the when. Its growth is spontaneous and to a larger extent seems unplanned. There is a lack of understanding of the institutions within which FLID operates and how the use of water and the attendant infrastructure is managed. In this paper, the theory of institutional bricolage is adopted to analyze whether locally developed institutions can promote the management of FLID. Using household interviews, KIIs, and FGDs data, the study identifies the institutions operating in the study area, their functions, and how farmers have adapted to the vacuum left by these institutions. The study finds that despite the existence of irrigation schemes in the area that have formal structures in place, their scope does not cover FLID and farmers have thus been forced to come up with their institutions in a patchwork of the old and new. These have been formed through institutional bricolage, which shapes and reshapes both bureaucratic and socially embedded institutions to develop hybrid institutions. The study concludes that there are different categories of institutions in the area; bureaucratic which have failed to acknowledge FLID, socially embedded in which the farmers are involved daily, and hybrid institutions which is a combination of both.

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INTRODUCTION

Farmer Led Irrigation Development (FLID) has been growing at a rapid rate and yet studies show the focus being on its informal nature and lack of acknowledgment by governments and policymakers. These studies highlight one of the reasons as being the lack of institutions governing its operations (Beekman & Veldwisch, 2016; Bosma, 2015; Namara et al., 2014). Institutions are key in irrigation as they enable ordered thought, expectation, and action by imposing form and consistency on human activities. Several studies have been carried out on irrigation institutions (Mdemu et al, 2017; Mziray & Mdemu, 2015; Rejekiningrum & Kartiwa, 2018, Patel et al., 2014) and this have offered useful insight on how irrigation institutions work in recognized forms of irrigation.

Kenya's, irrigation sector is governed by several institutions whose mandate is derived from the Irrigation Act 2019. These institutions operate at various levels and serve different purposes. In their management of irrigation in the country, their focus is on mainstream irrigation carried out in large-scale and community-based smallholder schemes; and private commercial farms (GoK, 2018). These schemes have established institutions that oversee their activities, ensuring adherence to regulations while leaving a vacuum where FLID is concerned. Policymakers and planners have limited understanding of the institutions involved in FLID, its operations, and its impact on mainstream institutions. The National Irrigation Authority, the institution responsible for irrigation development in Kenya, has decentralized its functions to local institutions. These entities have established regulations covering all facets of irrigation, including penalties for non-compliance (Irrigation, 2017). Yet, significant gaps remain regarding the governance and operational guidelines specific to FLID, questioning the effectiveness of current oversight frameworks in managing irrigation comprehensively. This underscores the oversight of FLID practitioners often labelled as "informal," despite their cumulative influence. FLID irrigators are thus put in the position of borrowing liberally from existing and newly introduced institutions to fill the vacuum left by mainstream institutions. These will be institutions that cater to different needs within the society that have elements that are useful to the irrigators such as financial management borrowed from table banking. Cleaver, (2012) in her study of institutions managing natural resources theorizes that in the absence of institutions, bricoleurs (actors) reshape arrangements borrowed from existing institutions to come up with their own in a process called institutional bricolage. This process takes place over time eventually leading to the legalization of these institutions. She categorizes institutions into two i.e. bureaucratic which are formal institutions that are introduced to the community and socially embedded which are longstanding informal institutions. Bureaucratic institutions are introduced to these socially embedded institutions, and the bricolage process is initiated through its key components. These include; improvisation, where the bricoleurs borrow and channel arrangements from available institutions to their situation. This is then followed by "hybridization" which combines these borrowed

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arrangements before "legitimization" which formalizes these institutions. The institution formed combines what has existed and what is newly acquired. This study adopted this theory to establish what form institutions have taken given the absence of FLID in existing institutions.

Summary of Literature Review

Institutions have been defined differently by various scholars depending on the school of thought one belongs to. The point of convergence however is that these are perceived as structures likely to impact on the behaviour of individuals or groups of individuals (Cleaver & Toner, 2006; Ostrom, 2003). Irrigation institutions are designed to enable the accomplishment of certain activities related to the water, the physical infrastructure for control of the water, and the organization of the farmers who manage the irrigation system (Hassenforder & Barone, 2018**).** Hollingsworth, (2000) sees institutions as organizations that set and enforce formal and informal rules, norms, and their underlying cognitive and symbolic systems. Hodgson, (2006) states that "Institutions are systems of established and embedded social rules that structure social interactions" and further goes on to argue that organizations cannot be viewed as separate from institutions and views these as a special kind of institution with additional features. The study adopted the views of Hollingsworth, (2000) and Hodgson, (2006) and defines institutions as organizations that set and enforce norms, formal and informal rules to regulate irrigation management with their role being to reduce uncertainty by establishing a stable structure to human interactions.

The study adapted the work of Frances Cleaver to demonstrate how people make do through three key processes i.e. hybridization, legitimization, and improvisation. This unfolds through the theory of institutional bricolage which posits that bricoleurs (actors) when faced with uncertainty will draw from available institutions to form hybrid institutions (Cleaver, 2002, 2012). The key construct of bricolage is making do which entails using what is at hand for new purposes. Cleaver further notes that people will make do by borrowing from existing institutions, styles of thinking, and accepted social constructs and use these to create institutions to suit their purposes. She goes further to note that a bricoleur is never just one thing. For example, the farmer who is a FLID irrigator is also a chairman in a social group, a businessman, and a church leader or a teacher. From these different roles, the bricoleur borrows what works and implements them within their roughly formed institutions (Cleaver, 2012). In summary, bricolage signifies people's resourceful use of what's available. They take existing resources, whether old or new, formal or informal, modern or customary, and blend them. This blending of elements creates something new and hybrid. These are then legitimized by referencing accepted practices, traditions, or modern trends.

Irrigation practice in the study area has been largely influenced by the irrigation culture which in turn forms the institutional framework. This will be related to the area's history of irrigation development and practice and will determine the quality and shape of institutions. The study area has a history of irrigation with the first scheme (Ahero Irrigation Scheme) having been established in 1969 and has since established several government-supported irrigation and community-based smallholder irrigation schemes. However, these schemes have faced various challenges with declining performance over the years (Republic of Kenya, 2015). This has necessitated the shift to alternative forms of irrigation such as FLID. Typically, the institutions in the study area are more focused on the recognized forms of irrigation with structures in place that govern operation and maintenance. These include the Small Holder Irrigation Support Organization (SISO) which oversees water distribution and management and the National Irrigation Authority (NIA) which manages the operation and maintenance (O&M) of the irrigation infrastructure. Where then does this leave FLID an area that is rapidly growing and in need of regulation? These irrigators have been left to their own devices and are a rule unto themselves. The study set out to establish the types of institutions in the study area, the type of

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infrastructure in place, how O&M is carried out, how water management is done, how conflicts are resolved, and any emerging issues.

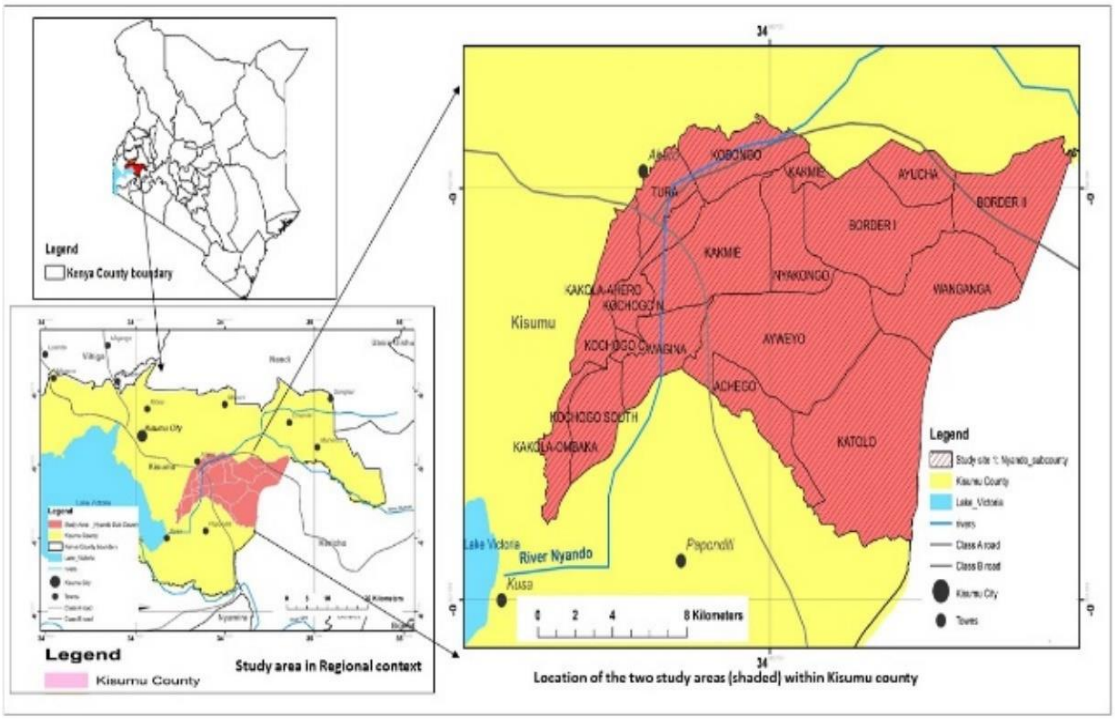
Methodology

Study Area

The study was carried out in Nyando Sub County (Fig 1) in Kisumu County which falls within the Lake Victoria lowlands and floodplains region. The sub-county lies between latitude 00 00' (the equator) and 00 25' South, and between longitude 340 45' East and 350 21' East. It is surrounded by Lake Victoria and steep hills and borders Nandi South in Nandi County to the north, Rachuonyo sub-county to the south, Kisumu East sub-county to the west and Kericho sub-county to the east (Government. of Kenya, 2010). A vast lowland flat area, geographically referred to as Kano plains, stretches in the middle of the sub-county while hilly terrains stretch in the northeast and the south. Kano Plains which lies in a depression is part of a large lowland area that forms the floodplain of the Nyando River. It borders the Winam Gulf a protruding part of Lake Victoria, at the end of which is Kisumu Town. The Kano Plains comprise predominantly black cotton clay soils with moderate fertility and poor drainage. The soil has good physical properties; however, crops may be adversely affected by impeded drainage during wet periods. This soil is largely used for growing sugarcane and other subsistence crops such as maize.

Nyando Sub County has Nyando and Sondu Miriu Rivers and a shoreline of 11 kilometres long. Rainfall seasons have in the past been classified as bimodal with the long rains falling between March to May and the short rains falling between September to December. However, with climate change rainfall patterns have become unpredictable with the onset of the rainy season coming early and frequent and longer dry spells (Mutua, 2012; Olang et al., 2012)

Figure 1: Map of the study area



Study Design

The study adopted a cross-sectional research design which allowed collection of data in multiple cases at once. The design is useful in analysis of the current situation and allows the use of various data collection techniques for triangulation purposes (Bryman, 2016). Factoring in the need for in-depth understanding of the

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workings of FLID, a mixed approach of both qualitative and quantitative methods was deemed appropriate. The study was carried out in Nyando Sub County which is found in the lower catchment of the Nyando river basin. The area was selected because irrigation schemes have been performing poorly in the area and as a result, farmers have turned to FLID and alternative crops. Two wards were selected i.e., Ahero and Kabonyo/Kanyagwal because of their proximity to water sources, the presence of irrigation schemes and irrigation practiced in the area.

A total of four Focus Group Discussions (FGDs) were held to provide information on the institutions operating in the study area, their roles and effectiveness in the management of FLID. Community leadership particularly the village elders were used to identify irrigators to participate in the FGDs. An exclusion (registered in an irrigation scheme/out growers) and inclusion (farmers who carry out individualized irrigation on farms they own, rent or through any other arrangements) criteria was employed. The unit of analysis was the FLID farmer household. FLID is a relatively new form of irrigation with no known register of irrigators. As a result, Cochran's, (1977) formula for determining the sample size for an unknown population was used to give a sample of 385. Snowball sampling was used to select households that participated in the study with the initial participants being selected from each grid. A stakeholder analysis in the irrigation subsector was carried out and used to identify 18 Key Informants.

Study Population

The study population was drawn from the two wards in Nyando Sub County namely Ahero and Kabonyo/Kanyagwal. The formula by Cochran, (1977) was used to determine the sample as shown below;

$$n_0 = \frac{z^2 pq}{e_z} = \frac{(1{\cdot}96)(.5)(\cdot 5)}{(.\square 05)\square^2} \cdot = 385$$

1

Where n_o =sample size; Z= the abscissa of the normal curve; e= desired level of precision; p=estimated attribute that is present in the population; q=1-p. (Assume p=.5 i.e. maximum Variability, 95% confidence level and ±5% precision).

Data Collection and Analysis

Various data collection methods were used, these included semi-structured interviews where a household questionnaire was used to obtain quantifiable data. This was conducted amongst FLID irrigators using both closed and open-ended questions. This was used to gain information on the type of institutions found in the area, how water management was carried out, and how conflicts were resolved. Additionally, gendered FGDs were conducted amongst four groups comprising twelve participants drawn from the two wards. These were used to provide a background on the institutions found in the study area including the roles they played and whether FLID had any influence on them. Venn diagrams were used to depict key institutions and the interrelations therein. Key informant interviews were used to gather the perspective of mainstream institutions on FLID. The following Key informants were interviewed; Chairman Small Holder Irrigation Support Organization (SISO), Irrigation Officer Kabonyo/Kanyagwal and Ahero, extension officer Rabuor, officials from various institutions (NIA, WRA, IWUAs, input suppliers, credit, religious and CSOs, and 4 key farmers). Secondary data was collected to gather background information on FLID and institutions in the area. The data was collected from the NIA, SISO, Ministry of Water, Sanitation, and Irrigation, Department of Agriculture, Livestock, Irrigation and Fisheries Kisumu County, Ahero Irrigation, and Southwest Kano Irrigation Schemes. Thematic analysis was carried out to identify patterns or themes within the qualitative data on institutions. Quantitative data was analysed using descriptive statistics which involves summarizing and interpreting the main characteristics of a dataset. The data was summarized into frequency tables and visualized through bar graphs and pie charts

Results and Discussion

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Institutions in Farmer Led Irrigation Development (FLID)

Irrigation management institutions are generally responsible for setting rules and regulations that will ensure irrigation is carried out in an orderly manner while also ensuring compliance. FLID being a form of irrigation should be bound by these institutions, however, it is not acknowledged and therefore is not bound by the rules and regulations set by these institutions. The study sought to identify institutions in the study area that were tasked with irrigation management and their engagement if any with FLID irrigators. It was established that engagement with institutions was determined by the FLID form practiced and the category of FLID irrigator in question. These forms include farmers irrigating within an existing scheme (Scheme FLID irrigators), farmers irrigating on the boarder of an existing scheme (Border FLID irrigators), farmers irrigating along rivers and lakes (River FLID irrigators) and those irrigating using water from wells, dams, water pans (Scattered FLID irrigators). Additionally, within FLID, there are different categories of irrigators determined by the arrangements they have in place for operating their FLID enterprise. These are outlined in table 1 below.

Table 1: Categories of FLID irrigators

Categories of FLID irrigators	Characteristics	Location
Individual FLID irrigators	• Own irrigation equipment • Own or rent land. • In charge of water management and O&M of the irrigation infrastructure	Located across the four forms of FLID
Rental FLID irrigators	• Rent irrigation equipment and land. • Operate on a temporary property rights basis or local arrangements known as "bar wa Bar." • Water management is at the discretion of the property rights holder, availability of funds to hire equipment and buy petrol as well as the availability of the equipment to be hired	Located across the four forms of FLID
Chama FLID irrigators	• Have informal groups in place. • Pool resources to higher equipment such as pipes and pumps and use a merry-go-round system to ensure all plots are irrigated. Subject to group rules on water management	Located within the River FLID irrigators

In the study area, 65% of the respondents indicated the absence of irrigation institutions governing irrigation while 18% responded favourably. Those who responded favourably were the Scheme FLID irrigators who operate under the scheme's management. Institutions were identified through an institutional analysis using a Venn diagram (figure 2) and these included: The Ministry of Agriculture, National Irrigation Authority, Ahero Scheme Irrigation Board, Water Resources Authority (WRA), Small Holder Irrigation Support Organization (SISO), Fair Trade Organization of Kenya (FTOK), Water Resource Users Association, Lake Basin Development Authority, United irrigators, Kenya Women Finance Trust (KWFT) and Arise irrigation group. For the institutions identified, their functions are very clear, for example, NIA is charged with oversight of irrigation development in the country, while WRA and SISO are charged with water management. The other institutions have functions ranging from financial to scheme management. These have been in place for several years and operate at different levels from the most

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basic level (micro) to the highest level (macro). Despite the presence of these institutions, FLID irrigators have been carrying out their operations independently. The study focused on institutions in the area and how irrigators have adapted in the absence of or failure of acknowledgment by these institutions.

Figure 2: Venn diagram of Institutions in Nyando Sub County

Water Management

Irrigation relies heavily on water, which has three main components. These are, acquisition which involves the abstraction of water; allocation which involves scheduling the water; and distribution which involves the delivery of the water as well as O&M of the irrigation infrastructure used for the delivery. It is crucial that these three elements are well managed since they determine how and when irrigators will get water. In the mainstream forms of irrigation this is a clear exercise determined by those in charge of the water supply. In terms of water management and water rights, FLID introduces a different scenario as opposed to what is known. Diverse approaches to water management are taken by these irrigators depending on the category as well as the form. We investigate water management institutions in two ways *1) By* categorization of FLID irrigators 2) By form of FLID practiced.

- **Water Management Institutions By Categorization of FLID Irrigators**

Individual FLID Irrigators

FLID irrigators who own their irrigation equipment and either own or rent land are largely a law unto themselves. These irrigators own pipes for conveyance of the water and pumps for abstraction and form 41.8% of FLID irrigators in the study area. Decision-making on their irrigation practice ranging from watering schedules, allocation as well as cropping season, crops to plant and O & M of available infrastructure is dependent on the individual.

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Within this category, 89% did not pay for water and according to 91.3%, this was because water is a God given right. This response points to the individual nature of FLID, however, the fluid nature of water implies that it cannot be localized to an individual. This is because, despite the source, its use impacts on other users. Irrigators who share the river for example need to be aware of the impacts of upstream users on downstream users. This is however not the case, discussants in an FGD held in Ugwe, express their challenges in handling these irrigators, especially in its O & M. The river becomes overgrown and filled with silt and periodically requires clearance. However, collaboration between individuals in the clearance and desilting of the river remains a challenge. Irrigators instead invest in clearing sections that are adjacent to their farms or that impact on delivery of water to their farms (figure 3). Downstream users are the hardest hit and are in most cases forced to pay for the clearance of the entire course of the river to provide water for their crops.

Figure 3: An Individual farmer-led irrigator clearing his portion of River Miriu in Nyando Sub County

The conundrum between upstream and downstream users is not new and has been studied by various scholars. These scholars raise various issues revolving around the need to establish the impacts of the use of water upstream on downstream users which may at times exceed the value of benefits. The National Irrigation Policy 2019, recognizes the need to mitigate the environmental impact of irrigation that is likely to lead to conflicts GoK, (2018) a sentiment echoed by (Giordano & de Fraiture, 2013). They further argue that irrigation always has impacts on downstream users and the environment. The nature of FLID is such that there are several abstraction points which then makes regulation and control difficult. In addition to this they remain largely unknown so monitoring their use of water resources is not possible. Beekman & Veldwisch (2016) further contribute to this debate and note that the increased diversion of water upstream will negatively impact downstream users and disrupt irrigation. Studies carried out in Burkina Faso by Fraiture & Giordano, (2014) cited FLID as being blamed for declining water quality and availability for irrigation systems located downstream.

The use of water for irrigation requires a careful balance between the upstream and the downstream users. However, with FLID we face various challenges that are a hindrance to achieving this balance. First, they are not acknowledged, secondly, we don't know their numbers and therefore determining their actual use of water sources is difficult. This means that as a country we are unable to monitor and control the use of water by these irrigators and put in measures to protect downstream users as well as

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the environment or mitigate the impacts of their use along the course of the river.

Chama FLID Irrigators

This second category of FLID irrigators consists of those who have formed groups called "chamas" that govern their operations and comprise 28% in the study area. Within this category, 27% responded that institutions were operating in the study area. However, these institutions mainly dealt with input provision and financial management. These irrigators pool their resources for all irrigation activities. In water management, a schedule is in place for irrigation of the farms where either pumps belonging to members or hired by the group will be used to abstract water. Additionally, pipes will either be pooled or hired depending on the distance of the farm from the source of water. The irrigation of the farms is then done in what is termed a "merry-go-round" that eventually ensures that all farms have been irrigated. The O&M of infrastructure is carried out by all members according to the group's unwritten rules. This category of irrigators was mainly found along River Nyando in Ahero ward and had borrowed aspects of their water management from the scheme, SISO, and NIA in the form of bricolage to be discussed later on.

In her studies on forest practices in Brazil, Koning, (2011) demonstrates how actors have come together to form institutions that oversee nut collection which has made it more effective. This took place through a process of acceptance and rejection of institutional arrangements in place. The act of pooling resources together has been cited by Mendez-Barrientos et al, who in their studies of water management established that farmers had come together and collectively owned a concrete structure for storing their share of water. With this, the farmers established their water needs for the season and then sold excess water to those in need. These studies showed that irrigation management thrives in the presence of institutions that will oversight their activities (Méndez-Barrientos et al., Molle, 2018).

Rental FLID Irrigators

In the third category, irrigators do not own irrigation equipment or land to carry out their irrigation practice. These irrigators have turned to alternative ways of acquisition which involve hiring of what is needed. They therefore hire irrigation equipment needed for abstraction and delivery of water in a conferment of temporary property rights for a specified period. This is based on the availability of funds which will determine the irrigator's ability to hire the required equipment. In the study area this comprised 51.9% and this presented a problem in water management. This is because the temporary rights accorded the irrigators use for a time meaning they were under no obligation to take care of the property beyond the period of use. In addition to this, due to lack of finances to hire, some irrigators were forced to get into local arrangements with resource owners known as "bar wa bar" which literally translates to "let us split". Here irrigators owning equipment would get into arrangements with those who do not that entailed use of equipment for a portion of the produce from the farm. These arrangements were at best beneficial to equipment owners and tipped the power balance in their favor while the owners of the farms were forced to agree to terms set by the owners of the equipment.

This sort of arrangement had existed in the scheme overseen by the former National Irrigation Board (NIB) now National Irrigation Authority (NIA) in what was a landlord-tenant relationship (Noij & Niemeijer, 1988). This gives us another example of the bricolage process where the actors borrow from institutions they have encountered. In this category, 84% responded that there was a lack of institutions in place to manage FLID. Since there are no institutions to address scheduling and allocation issues, water management is managed individually and is governed by the irrigator's financial capability to hire the pumps for abstraction and pipes for delivery. This presents a problem because water is a shared resource and should not be planned for and used in isolation. The question raised here is, what rights do water management institutions in the area have to demand compliance with their

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regulatory requirements from these irrigators? We have earlier noted that these irrigators remain unacknowledged, this means that, unlike mainstream irrigators who are registered and well-known, water management institutions are in the dark as to the numbers and location of FLID irrigators.

Such arrangements as those found here are not new and have been labeled as sharecropping or tenancy agreements by different scholars (Moon et al., 2020, Rahman & Othman, 2012; Yahuza & Idris, 2015). These systems are viewed as contracts that are put in place for those households lacking sufficient resources to carry out production. These can take various forms including land for inputs such as seeds, fertilizers, pesticides, or services for a share of the produce. Yahuza and Idris however warn that the disadvantage of these systems is that if managed incorrectly, they run the risk of taking advantage of the vulnerable. This is mainly because most of the decisions made in such instances are made by those who hold power over the resources or the equipment (Yahuza & Idris, 2015). The lack of an institution regulating FLID means that it falls through the cracks and therefore farmers can get away with unjust practices due to the lack of sanction and compliance mechanisms.

- **Water Management Institutions By Categorization of FLID Irrigators**

Border FLID Irrigators

These form 18.4% of the study population and are found outside and along the schemes' borders. They take advantage of the schemes' infrastructure and water. The main input in irrigation is water, which means that its management is key to productivity. Institutions charged with water management in the study area were mainly focused on irrigation schemes. These are well structured with registered irrigators and established Institutions in place governing their activities. The Irrigation Officer West Kano and the Chairman SISO express their frustration citing compliance with regulations as a challenge amongst registered irrigators. They further explain that for FLID farmers it is worse because they do not have the authority to demand compliance from them, the irrigator's abstract water illegally from the schemes canals and do so mostly at night. Manpower is lacking to patrol these schemes at night and as such these farmers are thriving. They mostly divert water meant for scheme use to their farms which is considered "water stealing" *(KII with Irrigation Officer West Kano and SISO chairman, 2021).* Water is used with impunity because according to 80.85% of the respondents, it is "God-given" and freely flowing so why pay for it?

> "*This lake has been here before I was born we have always used it for our needs. SISO has taken this water from the lake, they use it in the scheme and want to deny us water that is our God-given right, so why should I pay for it and yet they also took it from the lake without payment" (Irrigator Kabonyo/Kanya gwal)*

These sentiments are echoed amongst irrigators in the area, however, the SISO Chairman points to the failure to understand the process of abstracting and delivering the water from the lake to the scheme. This process requires pumps and the use of the scheme's infrastructure for conveyance which requires O&M, which requires resources. In the instances where capture irrigators are captured illegally abstracting water, equipment is confiscated, however, the authority to handle these cases is lacking due to the absence of regulations *(Field Notes 2021).* For 83.4% of the irrigators, it was reported that there had been no information on the need to pay for water use. SISO chairman says that this is because these irrigators are widespread, and they lack the manpower to traverse the sub-county identifying irrigators. He further says that out of those they have come across the ones who pay for water are the FLID irrigators that lease land from the scheme during the rice off-season *(Field Notes 2021).*

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Figure 4: Water payment recipients

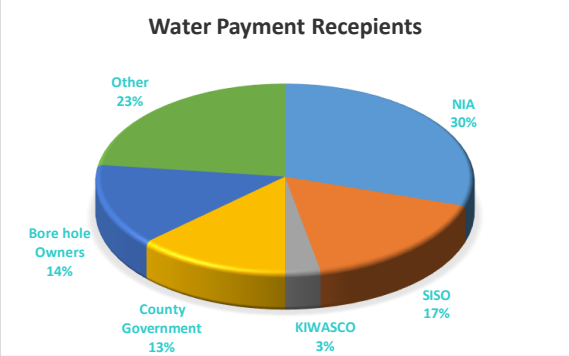

Figure 4 above shows the distribution of institutions that received payment for water. This clearly shows that water management has not been consolidated further bringing confusion to the irrigators on where payments should be made. This also reaffirms the position of the irrigators that water management is an individual affair. Several studies carried out on irrigation water management showed that there are often many actors involved in water governance without specific water management mandate. This fragmentation and lack of consolidation of water payment institutions create inefficiencies and obstacles in irrigation water management. This will also make tracking water usage challenging and make it difficult to enforce water use regulations and collect payments from non-compliant farmers. Additionally, it brings confusion amongst the irrigators on what regulations they are supposed to comply with in irrigation water use (Giordano & de Fraiture, 2013).

Scheme FLID Irrigators

These are irrigators who lease land from the scheme and irrigate during the rice off-season. They make use of the available infrastructure within the scheme, and one would assume that this makes it easier for follow-up. However, this was not the case, SISO chairman and NIA officer pointed out that these irrigators were aware of the requirements, but payment was problematic which sometimes forced them to take drastic action such as denial of water for use or confiscating equipment. The majority of respondents (86.3) reported that no action was taken for non-payment (Table 2). In other instances, the institution that owned the right to the water source could levy fines and penalties on the irrigators according to 1.6% of the respondents. These include taking part of the farmer's harvest equal to the amount owed to them such as a bag of rice or vegetables. Those who did not pay for water despite being aware of the requirement did not do so because the use of water is their “God-given right” (83.4%).

Table 2: Consequences of Non-Payment of Water (Scheme FLID Irrigators)

Consequence	%
Arrest of offender	0.3
Confiscating equipment	1.8
Exclusion from irrigation	1.9
Fines and penalties	1.8
Denied access to water	8.9
None	86.3
Total	100

River and Scattered FLID Irrigators

These are irrigators found along rivers and lakes, have their infrastructure in place, and operate within their own rules. It is easier to keep track of these irrigators because their farms follow the course of the rivers or lakes. In this case, the water officials still find it difficult to extract payment for water as claims abound from a lack of known rules for the same. According to SISO official Ahero, they are forced to patrol along river Nyando and Lake Victoria in the early morning hours when irrigators can be found in their farms. Irrigators are encouraged to pay for water but irrigators claim that this is a means of extortion.

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In the case of FLID carried out in areas where water sources are scattered such as "Yawo" (informal dams), boreholes, wells, water tanks as well as tap water. These were the most difficult to pursue because of their widespread nature. Neither SISO nor NIA has the capacity to monitor the activities of these irrigators and ensure compliance. They give several reasons for nonpayment as shown in figure 5.

Figure 5: Reasons for non-payment of water

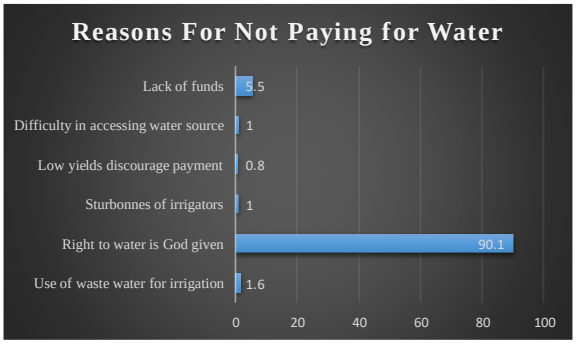


Figure 5 above gives a breakdown of reasons given for non-payment of water. A greater percentage (90.1) give their reason as being the "right to water use is God given". This is a recurring response when it comes to payment for water, clearly showing that there are no structures in place that govern its use. Further, these irrigators abstract water using their initiatives and O&M of any infrastructure that may be available is their responsibility. In addition, these irrigators are not formally registered, and they are therefore not accountable to either government or other institutions regulating irrigation on how they run their irrigation enterprise. This then makes it difficult to demand any sort of payment for water use or any of the activities carried out.

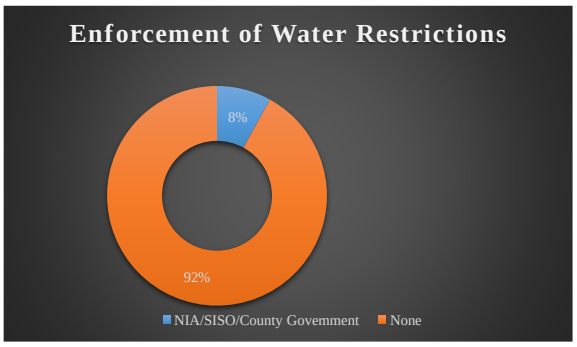
In both the categorization of FLID irrigators and the forms of FLID, it was clear that payment for water use was not a priority and in many instances irrigators claimed ignorance. They hold the belief that water is a God given right and therefore they have user rights without being asked for payment. In cases where irrigators were aware of the requirement to pay for water, they failed to do so because there were no consequences for not paying (85.6%). A complete distribution is given in Table 2 below. The few cases where action has been taken are all found amongst the FLID scheme irrigators who were bound by the scheme's regulations.

Table 2: Consequences of Not Paying for Water (River and Scattered FLID Irrigators)

Consequence	%
Confiscation of Irrigation Equipment	3.1
Prosecution of The Offender	0.5
Denial or Reduced Access to Water	8.1
Levying of Fines and Penalties	1.6
Prevention from Carrying out Irrigation Within the Farm	0.3
None	86.5
TOTAL	100

Figure 6 below shows the distribution of institutions that enforce water restrictions. 8% of the irrigators indicate that NIA, SISO, and the County Government carry out enforcement. The restrictions regarding water use are also not there according to 88.3% of the irrigators. The lack of a centralized institution that enforces water payment clearly shows the disconnect between institutions managing irrigation. This re-reinforces the irrigator's belief that demand for water payments is for the benefit of these officers.

Fig 6: Enforcement of Water Restrictions



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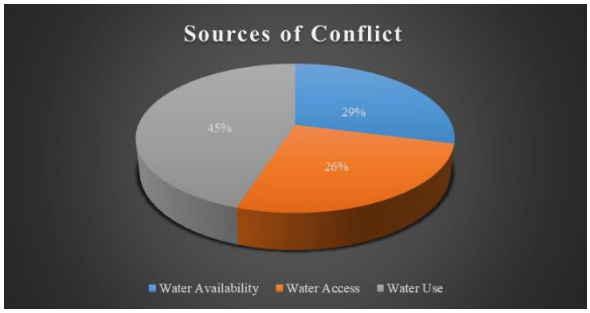
It is evident that for irrigators in the study area, water is predominantly considered a God-given right. This is a narrative that needs to be addressed because given the growing nature of FLID, it will lead to destruction and misuse of water resources. Water rights are defined as *"authorized demands to use (part of) a flow of water including certain privileges, restrictions, obligations, and sanction accompanying this authorization among which a key element is the power to take part in collective decision making about system management and direction"* (Veldwisch, Beekman, & Bolding, 2013). However, as seen in the study area this was not the case. This is further evidenced in studies carried out among irrigators in Mt. Meru, Tanzania where irrigators hold the belief that water is a gift from God, and as such payment for use was wrong. However, due to the collective efforts of the government as well as WUAs the narrative was slowly changing with regulations being enforced (Hillbom, 2012). This is however a slow process as demonstrated by Van Koppen & Schreiner (2019) in their study of statutory water law in Sub-Saharan Africa which showed that water is God given and should be shared by all humans and animals. The lack of institutions in this scenario is very clear, irrigators are operating based on assumptions and hearsay.

This lack of institutions presents further problems in resolving any conflicts that arise in the study area. For example 42% of the conflicts in the area are on various aspects of water management (figure 7). Water is a fluid and shared resource, this often leads to conflicts because of management done in isolation with no rules of engagement. This was experienced in the study area and cut across all forms of FLID and all categories of irrigators.

Figure 7: Sources of Conflict



The conflicts that took place majorly involved the FLID irrigators themselves (45%), 36.9% between FLID irrigators and government supported irrigators, and 2.7% between them and non-irrigators. Management of conflict requires institutional arrangements that will ensure that the conflict is resolved to the parties' satisfaction. In the absence of such arrangements, conflict resolution becomes the responsibility of available mechanisms while the outcome is left to chance. The study also looked at the level of satisfaction with the conflict resolution measures. Figure 6 shows the level of satisfaction with the resolution of conflict in the study area. Notably, the area that has a modicum of satisfaction is Ahero ward which is the area that has the highest users of river water, 76.9% an area that can be accessed by SISO and NIA. The actions taken in the event a conflict arises are at the discretion of the offended irrigator. In Kabonyo/Kanyagwal we encountered an irrigator who sprayed his crops with a herbicide and pesticide that was harmful to livestock which resulted in the death of the neighbor's livestock. The reason for this action was that the livestock were not manned and constantly destroyed his crops. In retaliation the owner of the livestock destroyed the crops leading to violence between the two parties. The village elder was unable to resolve the issue and this was escalated to the local administration, eventually creating enmity between the two parties (FGD, 2021).

Institutional Bricolage in Farmer Led Irrigation Development

It begins to emerge that in the study area, FLID irrigators operate outside of known institutions and their attendant regulations, or is this the case? We start by looking at the institutions charged with irrigation management nationally and at the county level and look at their roles as established by the irrigation act 2019 and what gaps have been established for FLID. From table 3 below, irrigation institutions at both the national and county levels have in place regulations that consider all aspects of irrigation from its development, water management, sanction mechanisms, conflict resolution mechanisms, marketing, research as well as future growth

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(GoK, 2018). All these regulations are, however, in place for the management and development of irrigation schemes. These regulations are silent on FLID, its existence as well as its management and development.

Table 3: Identified gaps in irrigation institutions

Institution	Functions of Irrigation Institutions	Identified Gaps
National Irrigation Authority	Mandated under the Irrigation Act to carry out the following activities. ✓ Irrigation development to include infrastructure, in national or public and smallholder schemes, countrywide. ✓ Facilitate formation and strengthening of IWUAs at scheme level. ✓ Raise funds for development of infrastructure of national, public, and smallholder schemes. ✓ Facilitate formation of a dispute resolution committee to resolve disputes relating to scheme management in consultation with county governments and other stake holders. ✓ Provide technical advisory services on water management and development of irrigation infrastructure. ✓ Promote marketing and safe post-harvest activities for produce. ✓ Carry out periodic research to determine and make recommendations on the production of irrigation schemes.	Focus is on national irrigation, private and smallholder irrigation schemes.
County Irrigation Development Unit	Mandated under the Irrigation Act 2019 to carry out the following|: ✓ Identification of community-based smallholder irrigation schemes. ✓ Development of a database for monitoring and evaluation of irrigation in the county ✓ Mainstreaming of statutory regulations in the irrigation sector as outlined by the act. ✓ Build capacity of farmers on conflict resolution and management of irrigation schemes. ✓ Formulation of Dispute Resolution Committees ✓ Enforce compliance with regulations on damage, tampering with irrigation infrastructure, watercourse, equipment, and other appliances; destruction and potentially destructive activities to river catchment areas;	The focus is on irrigation schemes located within the county.

This then leads us to the question of what happens in this case where FLID seems to operate in a haphazard manner and seemingly without regulations and direction. Cleaver theorizes that local adaptations are formed in the "necessary improvisations of daily practice (Cleaver, 2012). In the study area, we see the three characteristics of bricolage begin to manifest. For example,

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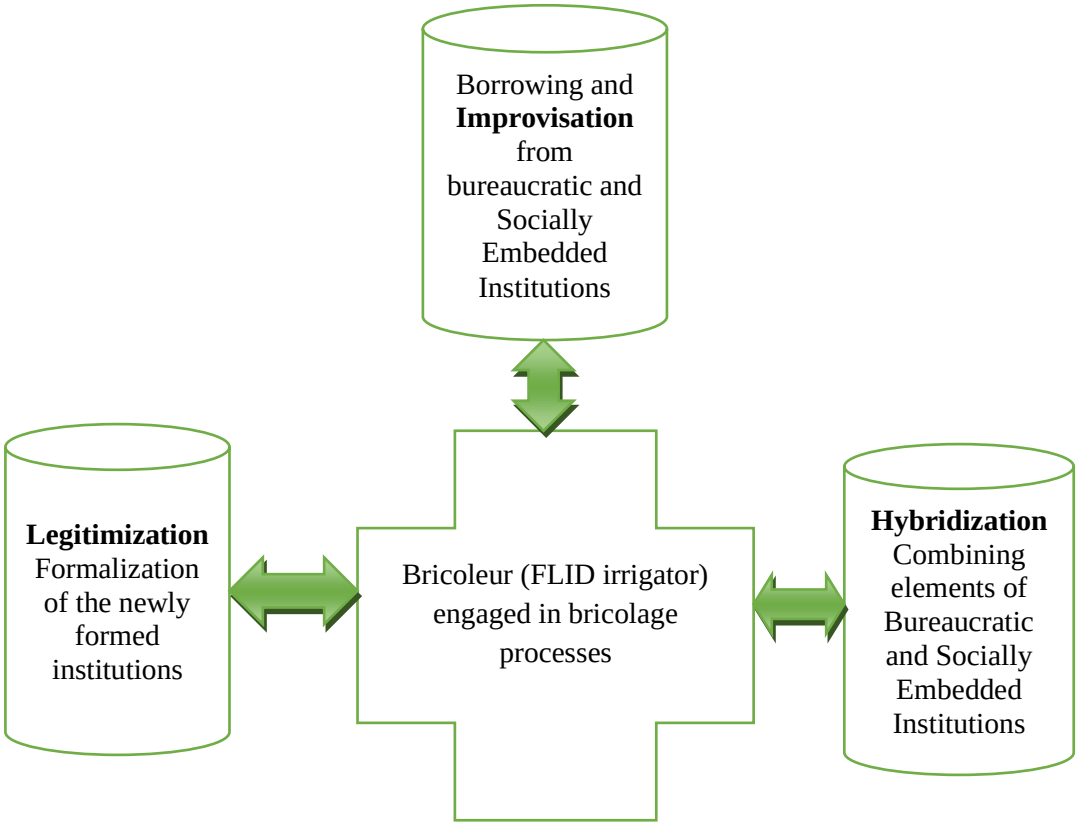
improvisation is seen where the River FLID irrigators in Ahero ward have come up with "unwritten" rules that determine how water scheduling, allocation, and delivery is done. They also have in place sanction mechanisms, conflict resolution mechanisms as well as financing rules (table banking).

Figure 7: Bricolage process among the FLID river irrigators in Nyando Sub County



Using figure 7 above, we demonstrate how river FLID irrigators are adapting to form their institutions for management. In the first step, borrowing from bureaucratic socially embedded institutions has taken place in a bricolage process called improvisation. Irrigators in Ahero have borrowed aspects of management from NIA, SISO, and scheme management. For instance, some farms are not located near the river and this makes the conveyance of water expensive in terms of fuel and equipment. This has necessitated the use of innovative ways to convey water to the farms. In this system, irrigators will bring together the pipes that they own and pool to hire a petrol pump and purchase fuel. A watering schedule has been agreed on and pipes are joined together to enable a wider reach. Conflicts that arise are resolved amicably amongst the irrigators. This has put in place an informal institution with rules that are not documented but are known to all. *Improvisation* is also seen in the shift to planting new crops (termed upland) as opposed to the traditional rice which has been planted in the area since the inception of the first scheme in 1969 (Republic of Kenya, 2015). In addition, aspects of loan disbursement and management were borrowed from local banks while table banking was borrowed from local women groups. These have been combined with other arrangements borrowed from social networks, church groups as well as the local administration and have been taken through the second step which is *hybridization*. Here these borrowed arrangements are combined with the end product being arrangements that form an institution for FLID management albeit an informal one. The third

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which is *legitimization* is not an easy process and requires delicate handling to convince members of the need for the institution to be formalized. This is where these River FLID irrigators find themselves.

The challenge with such informal arrangements is that they are based on mutual respect and goodwill and as such enforcing the restrictions in place is a challenge. These arrangements are not limited to water management but extend to the sale and marketing of produce with inherent problems. A case in point is where one irrigator mobilized fellow irrigators in tomato farming to form a group where they would market their produce collectively and have bargaining power. This failed to work due to a lot of mistrust and suspicion.

> *"I brought the tomato irrigators in this block and told them the benefits of forming a group, that it would give us bargaining power to enable us to control the price of tomatoes and therefore give us a chance with the market cartels. They refused and said that I was after their money. So, each farms and sells their tomatoes but we can't get a good price because we are not together. The middlemen make more on our tomatoes than we do" (Elizabeth Koyo, irrigator, Block C, Kabonyo/Kanyagwal 2021)*

Similar cases are met in the study area especially where tomato farming is involved with middlemen controlling the prices of produce due to the lack of a cohesive unit. One of the key farmers who was among the first people in the study area to venture into large-scale watermelon and butternut farming says that the poor performance, misinformation, and lack of sensitization of the previous institutions has led to the current situation. In the study area, there is a lack of trust in the institutions available, such mistrust has been brought about by a lack of transparency, especially by the leaders who fail to disclose pertinent information to irrigators leading to adverse action from financial institutions.

> *"I belong to a women's group and through our group, we were told we could access loans from a certain NGO. I took the loan because I needed money to pay for seeds, fertilizer, and pesticides for my farm. I got a loan of Kshs. 36,000 and the agreement was that I was to pay Kshs 1000 every month and I have been doing this through our group chairlady. The other day the NGO officials came to my home at night claiming that I had defaulted on my loan payments and yet I have never missed a payment. They took my two cows because of this, and because I raised an alarm I was arrested and spent the night at Rabuor police station. My daughter reported the matter to the chief and the group chair lady says she is sorting out the matter with the NGO. In the interim, I have lost my cows and I don't know where the truth lies about my loan repayment" (Grace Achieng, Irrigator; Nyakalewa)*

This incident is just one of many that discourage irrigators from seeking institutional intervention. However, the absence of a framework for these irrigators provides a ripe ground for unscrupulous individuals to take advantage, especially of the rental FLID irrigators. Despite the lack of documentation or formalization, this vacuum is being filled by institutions that are in the formative stages, and some are well on their way to being established. These as we have already seen have been developed through bricolage. A good example is found in block C which is irrigated during the rice off-season in West Kano irrigation scheme in Kabonyo/Kanyagwal. Here irrigators have set up rules covering the following areas: water scheduling, crops to be planted (e.g. rice cannot be planted next to tomatoes because the water needs for rice are very high and this will destroy the tomatoes therefore affecting their productivity), what pathways can be used to access the farms and conflict resolution.

At the time of the study, for example, conflict was in progress at Block C where an irrigator had planted rice in between a tomato and a kale irrigator and destroyed both crops. The matter was escalated to the local authority because the culprit

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was not cooperative. Other informal arrangements exist where irrigators have come up with various ways of addressing issues as they arise in their localities. For instance, irrigators who do not have capital have various options available to them, they can borrow from their table banking groups, mobile loan applications or they can come up with informal arrangements for inputs. For instance, irrigators with tractors will trade their services for partial ownership of the farm. This is all temporary but for the duration, he/she will own part of the farm and will get produce from the same. Similarly, inputs are given on credit for payment post-harvest either in cash or kind (KII, FGD, 2021). These are all unwritten and together with several other aspects begin to form an institution within which these FLID irrigators operate.

Various scholars agree with the theory of institutional bricolage due to its focus on flexible and adaptive arrangements. It is seen as offering a means to better understand the "messy' nature of institutions (Peloso & Harris, 2017). Studies carried out in the Bolivian and Ecuadorian Amazon on nut collections demonstrated how bureaucratic and socially embedded institutions are patched up through the bricolage process to come up with hybrid institutions (Koning, 2011). Other studies carried out in Ethiopia indicate that Institutional Bricolage helps us understand the dynamics of irrigation development while aiding in building appropriate institutions that can fit the poor (Sakketa, 2018).

Conclusions and Recommendations

In this study, we set out to explore whether locally developed institutions can be used to manage FLID. The results showed that FLID is a new entity whose position in mainstream irrigation institutions is unclear. Neither its positive contribution to food production, income generation, and increase in area under irrigation nor its negative impacts such as uncontrolled use of water, inputs, and pesticides have been considered. This form of irrigation is growing in a spontaneous manner and at an alarming rate. The study further established that due to the vacuum left, some irrigators have come up with arrangements that will govern FLID. These are informal arrangements that have been borrowed from available institutions and are being worked and reworked through the bricolage process and will eventually form institutions that will be legitimized. There is a need for irrigation institutions to start taking notice of FLID and incorporate it in their frameworks. Lessons learnt from the study area show the need for the government and policy makers to incorporate FLID in the irrigation agenda taking into account the institutions the irrigators are already putting in place. This will ensure that there is regulation of water use given that this is a shared resource.

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