



SMALLHOLDER FARMERS' PERCEPTIONS ON THE USEFULNESS OF LOCAL KNOWLEDGE IN IMPROVING WATER USER RIGHTS IN KIRU VALLEY TANZANIA

Menda, F.P.¹, Kaswamila, A.² and Msongaleli, B.³

¹*Institute of Development Studies, University of Dodoma, P.O. Box 259, Dodoma, Tanzania.*

^{2&3}*Department of Geography & Environmental Studies, University of Dodoma, P.O. Box 259, Dodoma, Tanzania.*

¹*frankps123@yahoo.co.uk*

ABSTRACT

Purpose: This paper intended to investigate why local knowledge (LK) is becoming an important aspect of water management in semi-arid basins to increase crises of water user rights around the world, especially in Sub-Saharan Africa.

Design/Methodology/Approach: The paper adopted a cross-sectional research design to make sense of the existing situation. Data were collected using qualitative methods. A sample size of 70 water users was involved in the study. Triangulation of research methods was used to collect qualitative data. Qualitative data were summarized using content analysis while quantitative data were summarized using SPSS.

Findings: The results showed the presence of LK has an influence on water use in the valley. The local community in the valley was unable to show up its all influence because of formal water institutions. The formal and LK institutions were interlinked in their operations. However, the local community elders were unable to resolve water conflicts because of not recognized by the formal water institutions. Concerted efforts are needed to build the capacity of the local community in ensuring water user rights.

Research Limitation: The limitation of this study was the unavailability of the community elders and the language barrier e.g., *Iraqw* affected the data collection and analysis of the study.

Practical Implication: The study will bring new knowledge to formal and informal water institutions that can help smallholder farmers to use water effectively and wisely.

Social Implication: The perceived information is useful for policy makers and other key actors in formulating effective institutions to engage the local community in water management.

Originality/Value: This is a relevant study that seeks to develop a locally based institutional framework to enhance water user rights in the valley.

Keywords: *Farmers. local knowledge. management. user rights. water.*

INTRODUCTION

The ongoing debates on local knowledge (LK) against water user rights for smallholder farmers gained global momentum in recent years (Said, 2008; Mosha, Kajembe, Tarimo, Vedeld, & Mbeyale, 2016; Gudaga, Kabote, Tarimo, Mosha, & Kashaigili, 2018). It is increasingly recognized that LK is important in enhancing effective water governance for the local



community (Kweka, 1998; Kairuki, 2021). Hence, to realize water benefits in different global countries, there should be well-built local knowledge (e.g., Cultures) at the local levels (Kadigi, 2016; Hudgson, 2015; Gadzirayi, Mutandwa, Chihya, & Chikosha, 2006). In Sub Sahara Africa and elsewhere, there is local knowledge of water arrangements that operate at various levels to manage water (Patel, *et al.*, 2014). The LK arrangement starts from local to central authorities (Muginya, 2013; Boelens & Von, 2006). These LK arrangements have changed water governance whereby the local community's responsibilities are transferred from the local to the central or private sector for effective water arrangement (Nguyen & Ross, 2017).

Kaswamila and Malipula (2013); Tenge and Kaswamila (2001) argued that traditional knowledge shapes and controls human behaviour in managing water resources. Furthermore, these are shared cultural guidelines for governing stakeholders on how, when, to whom, why and where the water resource should be managed, accessed, utilized and achieved (Gadzirayi *et al.*, 2006). In other words, Oremo (2019); Moshi *et al.*, (2016); Kadigi (2016), posit that LK which improves water user rights are most effective in agreement with local settings. They are flexible to accept the ever-changing conditions of local-level resource users among other traits. However, water user rights are often restricted to effective local water arrangements, which include a co-management approach (Muginya, 2013).

On one hand, in most river basins, co- water management approach in water governance has been practised. These are formally developed institutions like ministries of water, zonal irrigation units, basin water bodies, water user associations and basin water offices. These are polycentric systems prescribing concrete solutions and interventions for inefficiencies in water management (Komakech, 2013; Richards, 2019). Moreover, LK in water arrangement is linked to the utilization of local norms, behaviours, code of conduct and social taboos (Boelens & Von, 2006). This interdependence of water institutions allows coordination of solving smallholder farmers' problems of water user rights by the communities themselves (Richards, 2019; Kadigi, 2016). According to Nguyen and Ross (2017); Kaswamila and Masululi (2013), the utilization of LK (e.g., norms and behaviours) has been reported to help smallholder farmers to interact, learn and understand their daily decisions (e.g., solving conflict) on water irrigation systems on daily basis. This gives them a voice to be trusted in establishing the basin water arrangement platform among smallholder farmers (Patel, *et al.*, 2014; Oremo *et al.*, 2019).

The prime examples of such LK were experienced in Ethiopia, where the basin was controlled by *Abba Laga* (father/leader) as a local leader of the basin, *Abba Adere* (father/leader of a group of villagers), *Cheffe Kore* (basin committee) and *Garee Misooma* (development committee) (Boelens & Von, 2006; ILO, 2019). Further examples, in Mozambique, in smallholder furrow irrigation that is an earthen canal, a local canal constructor tended to own, distribute, regulate and



solve water problems communally in basins earlier than 20th C (Gadzirayi *et al.*, 2006; Nguyen & Ross, 2017).

In Tanzania, and elsewhere, at the community level, water and its governance, are considered a “gift from God”, a “spiritual role”, “owned by no one”, and water fee paying is a “sin against God” (Gadzirayi *et al.*, 2018; Richards, 2019).

In line with the co-management approach, the country since its independence (the 1960s) has applied the Ramsar Convention of 1971, Dublin Principles of 1992 to improve water governance by reducing the influence of LK based approach. ILO (2019) and URT (2016b) argued that the new model enables the state to become an engine than LK for modernizing, protecting and planning water basins through Water User Associations (WUAs), Basin Water Bodies (BWBs), Basin Water Committees (BWCs) and achieve equitable water user rights. LK has been vital for human life for ages (Franks, 2010). Within basins, any LK-related water system is important for water governance; e.g., a socio-cultural water system is necessary for water user rights (Nguyen & Ross, 2017). Despite such importance, LK is still a questionable institution among users (Nguyen & Ross, 2017; ILO, 2019). On many basins, serious competing water governing systems e.g., LK and formal systems between water users have existed in human evolution (WWF, 2016).

Population pressure, migrations and globalization have slowly changed the LK of particular water governance and brought different water governing systems (Eeden, 2010; ILO, 2019). Water rights from a riparian perspective are said may give smallholder farmers the right to control and access sufficient water, either physically or economically, at all times to satisfy their farming goals (ILO, 2019). In response to promoting water users’ growth in basins, Tanzania, supported local systems e.g., traditional technologies (*vinyungu*) to improve the livelihood of the local community. The traditional technologies were used, to (a) solve water stress (b) control and/or maintain an efficient supply of water and (d) protect local user’s rights over water resources in different segments of local users, including smallholder farmers (URT, 2016b; Kadigi *et al.*, 2016).

Previous studies by Kaswamila and Malipula (2013), Tenge and Kaswamila (2001); Kadigi *et al.*, (2016), investigated traditional systems that have positive results on the promotion of water users’ rights in Tanzania. For example, Saadan, Rufiji and Pangani valleys and Iringa demonstrate that traditional irrigation systems can work effectively and solve water stress (conflicts, competitions, exclusion) among smallholder farmers and are likely to increase water user rights. There is no clear picture of the smallholder-farmers perception of the usefulness of LK in improving water user rights. Most of the studies above leave empirical gaps and debate whether LK contributes to equitable water users’ rights. Therefore, this paper investigated the



smallholder farmers' perceptions of the usefulness of LK in improving water user rights from several angles in semi-arid areas.

THEORIES UNDERPINNING THE STUDY

Common Pool Resources Theory

The first theory underpinning this study is the Common Pool Resource Theory (CPRT) was developed in the last 20 years by Elinor Ostrom in 2010 and modified by Saunders (2014) considered the theory of collective action in natural resource management among users or beneficiaries. The CPRT contends that sharing resource equally is essential for the survival of the risk users (Van Koppen & Schreiner, 2018). River basin involves many stakeholders, some are free riders at different levels and establishing rules for one level but not on others could lead to an incomplete system.

New Institutionalism Change Theory

The second theory underpinning this study was proposed by March and Olsen (1984) and explains a useful understanding of the sociological and relationship view between resource and institutional patterns, the way they interact, co-exist and affect each other. The main argument for change is to modernize the local knowledge (e.g., culture, norms or behaviour) rather than eliminating an old institution to maintain its originality. The perceived LK can be harmonized with the newly introduced institutions to modify and shape the new institution.

Empirical Review

The empirical literature on the LK against water user rights from several studies is also not conclusive. For instance, Edastav (2010) noted that previous studies on the river basin institutions had varying results. The mixed results regarding the impact of the role of LK, since it is hard to be simply addressed and generalized about the local knowledge of water user rights (FAO, 2015). For example, the available empirical research by Jaspers and Gupta (2009); Agrawal, Kononen, and Perrin (2009) on using formal and LK analysis to improve water user rights in the valley, needs to include:

- i. Water Management on hydrological boundaries
- ii. A platform where stakeholders can involve in decision making
- iii. Authorities for river basins and sub-basin to incorporate decision-making at the lowest appropriate level with their respective bylaws
- iv. A planning system for integrated river basin plans
- v. A system for water pricing and cost recovery

RESEARCH METHODOLOGY

The study was conducted within the Kiru Valley in the villages namely Kiru Six, Mawemairo, Matufa and Mapea-Magugu of Babati district of Manyara region. The valley was selected



because local knowledge is decreasing rapidly due to many formal existing water institutions in the valley. The human population is also increasing rapidly because of immigration, jeopardizing local water sources, management and user water rights. Both upper and lower village water streams were involved in the study. A village water stream is defined, in this paper, as an area of countryside or land of a particular type, it can be an upper or lower village stream used especially when talking about its appearance. The targeted population was smallholder-farmers because they are the main water users in the valley. The study adopted a cross-sectional research design to collect quantitative and qualitative data at the same time and at one point in time. The interview checklists and questionnaire were the main data collection tools and they were used to collect types of data focusing on the relationship between variables. Both closed-ended and open-ended questions were used.

Sampling Technique and Sample Size

The study involved 4 (four) villages in the valley. The choice of villages was informed by the availability of water sources, small-scale irrigation schemes, and proximity to a Kiru valley. This study was conducted using quantitative and qualitative research methods. The sample size in qualitative research is much smaller than what is used in quantitative research (Glenn, 1992; Creswell, 2014). However, Bryman, (2004); Kothari (2014) explained that the sample size must be large enough to examine all viewpoints. This helped to achieve saturation and by using an appropriate sample size the saturation was reached. In this study, village-registered smallholder farmers with less than two hectares were selected. In this study also, the WUA model group was studied. This group was used to get their deep and detailed experiences and perceptions on the adoption of the LK and multi-water institutions used in the study area. Sampling frames were prepared in each village by listing all smallholder farmer's households. The total sample size was 70 respondents of saturation was reached. The study interviewed heads of household or any adult person in a household, a man or woman. Quantitative data were collected using a survey method with smallholder farmers whereas qualitative data were collected using key informant interviews with Local Government Authorities (LGAs) and Water Basin Offices (WBOs). One Focus Group Discussion in each village was conducted to collect information on local knowledge and water user rights. Qualitative data focused on the capacity of LK to monitor and manage water at different levels and informal institutions governing water and land resources management, mechanisms, procedures and capacity to resolve water resource conflict. A checklist of items was used to guide qualitative data collection. Gender consideration was substantial during the selection of FGDs participants because different gender groups have different interests in LK and water resources. To that effect, it was essential to capture information from men and women.

Data Analysis

Qualitative data analysis involved summarizing field notes based on the objectives of the study. The analysis also involved content analysis. Quantitative data analysis involved coding, data



entry using Statistical Package for Social Sciences (SPSS), data cleaning, verification and analysis.

FINDINGS AND DISCUSSION

In the context of this study, LK encompasses bylaws, customs, norms, and traditional social network activities e.g., councils of elders and certain individuals holding specialized knowledge based on their functions such as local governance, community resource mobilization, security, asset management, and conflict resolution, management committees for infrastructure and sector services. In the study area, the interviews, FGDs and literature reviews reported that due to the scientific reforms LK has been still a part of and has much influence on designing and implementing institutional water changes in Kiru Valley.

According to in-depth interviews and key informant's views especially in Magugu-Mapea noted that with a top-down approach, the LK (culture) is a very essential institution that can play a pivotal role in attaining sustainable water user rights but it is not recognized well in day-to-day water use or/and irrigation activities as useful and applicable weapon enhancing water rights (e.g., distribution, allocation and accessibility) in the valley and therefore, not a priority for water use development process, for instance, one of the local smallholder-farmers was heard in Matufa village saying that "*several times we (water users) have been called upon by the World Vision of Tanzania (NGO) officers to attend a building capacity training on using modern water systems like canals replacing traditional canals*", this implies that the local infrastructures are discouraged to be used by the development partners including the government authorities in the study area. Similarly, in the studies by Kaswamila and Masuruli (2004); Kairuki (2021), the LK is used in encouraging water use and management should include, human norms, attitudes, behaviour and cultures all should have been introduced by the recent institutions as part of the management skills, their necessity has brought a lot of positive changes among users feeling, owning and effectively participating in all critical stages of management projects.



Table 1: Usefulness of Local Knowledge in Water Use.

Local Knowledge Type	Examples/Methods	Local Role	Site/village
Social Networks	e.g., neighbourhoods, community meetings and farm groups	Participate in all water-related issues (guarding) e.g., prohibit bathing, washing clothes	Very Highly Useful in Magugu-Mapea
	forefathers/ancestors and respected elders as headmasters in irrigation activities Communal governance e.g., communal water source/forest	Ensure adequate water allocation at the right time Act as conflict mediators during water crises and conflict Support accountability (everyone is responsible)	Highly Useful in Magugu-Mapea and Kiru Six
technological water systems	e.g., local digging canals, wells, boreholes	Support irrigation systems at a low cost	Very Highly Useful in Magugu-Mapea
	e.g., wooden pivot gates and bamboo drop irrigation used in springs and streams to supply water in farms e.g., sticks and stones (stone lines and pitting system)	Permitting and regulating partial water control (open and close) Identifying water, plots/farms Support water flow in farms	Very Highly Useful in Magugu-Mapea Highly Useful in Magugu-Mapea
Environmental water systems	e.g., Fires	Clean farms	Moderately Useful in Magugu-Mapea
	e.g., Termites	Predict climate and water availability and a good indicator for groundwater moisture	Very Lowly Useful in Magugu-Mapea
	e.g., local and modified plant Species/crop i.e. LK creates planting time e.g. cultivation of low moisture adaptive crops	Use less water and resistant crop, efficiently used in semi-arid areas Predict close water table	Very Highly Useful in Kiru Six, Matufa and Magugu-Mapea
	e.g., bench terracing (i.e., 0.5-3m high), land levelling <i>Mikuyu</i> trees (ficus spp) or/and vegetation	Control movement of water and flooding Control and predict the presence of water in springs, wells, aquifers and forests	Very Highly Useful in All four study villages
Cultural water systems	e.g., prohibited norms i.e., bathing, washing clothes and utensils in canals	Control Water pollution	Lowly Useful in All four study villages Very Highly Useful in All four study villages
	e.g., prohibited taboos i.e., sacred/godly water in sources	Support conservation and protection	Moderately Useful in Kiru Six (source of water)



	Exempted and privileged e.g., pregnant women, 60+ years old and disabled (Use water freely, not to work)	Improve division of labour and empowerment in the basin	Highly Useful in Magugu-Mapea
	e.g., local fines/punishments to water use violators i.e., grazing, defecating, burying dead organisms, realizing toxic materials, discarding dead carcasses and fines were money, meet, wine, legal frameworks (village, ward and courts)	Support conservation and protection and improves ownership and accountability	Very Highly Useful in All four villages
Spiritual water beliefs	e.g., all water in the river is God given gift	People stay away from water bodies Keeping water sources well protected	Moderately Useful in All four villages

Source: Field Data (2020)

N.B. Very Highly Useful (5); Highly Useful (4); Moderately Useful (3); Lowly Useful (2); Very Lowly Useful (1)

CONCLUSION

The findings from the study showed that LK is part of the social and natural life in the basin since it is perceived through folk mythologies, legends, songs, community rules, religious rituals, and so forth which are translated into day-to-day water use. In the study area, there is a poor relationship between formal water institutions including WUA, LGAs, and BWO against the LK practices.

Recommendations

The lack of sound science-based information to inform water use plans can at least be partly addressed by making more use of modern data. Examples of such data sources include Google Earth maps (which include historical data to allow for trend analysis) and the FAO-CEO-CEPAL system for monitoring water and land use change. It is recommended that the Ministry of Water engages with stakeholders in water use planning on the sources and standards for scientific data that can be used in conjunction with local knowledge to inform water use plans.

REFERENCES

- Agrawal, A., Kononen, M., & Perrin, N. (2009). *“The Role of Local Institutions in Adaptation to Climate Change”*, Social Development, World Bank, NW Washington, 20433, [http://siteresources.worldbank.org/EXTSOCIAL_DEVELOPMENT/Resources/244362-1164107274725/sdp118.pdf], Site visited on 2020/10/10.
- Boelens, R., & Vos, J. (2011). The danger of naturalizing water policy concepts: Water productivity and efficiency discourses from field irrigation to virtual water trade. *Agricultural Water Management*, 108(2012): 16– 26

ISSN: 2408-7920

Copyright © African Journal of Applied Research
 Arca Academic Publisher



- Bryman, A. (2004). *Social Research Methods*. 2nd Edition, Oxford University Press, New York, 592.
- Clarke, V., & Braun, V. (2013). Teaching Thematic Analysis: Overcoming Challenges and Developing Strategies for Effective Learning. *Psychologist*, 26(2), 120-123.
- Cooksey, B., & Kikula, I.S. (2005). "When Bottom-UP Meets Top - Down: The Limits of Local Participation in Local Government Planning in Tanzania". REPOA, Special Report No. 17.
- Creswell, J. W. (2014). *"Research Design": Qualitative, Quantitative, and Mixed Methods Approaches*. Thousand Oaks, Calif: Sage Publications.
- Edestav, J. (2010). *Water Management of River Basins; A case Study in Kiru Valley, Tanzania; Sodertorn University College, School of Life Sciences; Bachelor's Thesis 15 ECTS/Environment and Development Programme/Spring 2010*.
- Franks, J. (2010). Boundary organizations for sustainable land management: The example of Dutch Environmental Co-operatives. *Ecological Economics*, 70(2), 283-295.
- Gadzirayi, C. T., Mutandwa, E., Chihiya, C., & Chikosha, M. (2006). *Indigenous Knowledge Systems in Sustainable Utilization of Wetlands in Communal Areas of Zimbabwe: A Case of Hwedza District*, Department of Agriculture, Bindura University of Science Education, P. Bag 1020, Bindura.
- Glenn, D. I. (1992). "Determining Sample Size", *Fact sheet peod-6*, Florida Cooperative Extension Services, University of Florida, U.S.A.
- Gudaga, J. L., Kabote, S. J., Tarimo, A. K. P. R., Mosha, D. B., & Kashaigili, J. J. (2018). Effectiveness of groundwater governance structures and institutions in Tanzania. *Applied Water Science*, 8(2), 1-14.
- Hudgson, G. M. (2015). *Conceptualizing Institutions Evolution and Future*: University of Chicago Press Books, US; press.uchicago.edu/ucp/books/chicago/c/bo.18523749.html.
- International Labour Organization (ILO), (2019). *Employment Intensive Investment Programme: Local Resource-Based Approaches in Water Works*. Copyright © International Labor Organization.
- Jaspers, F., & Gupta, J. (2014). Global water governance and river basin organisations. In *The politics of River Basin Organisations* (pp. 38-66). Edward Elgar Publishing.
- Kadigi, R.M.J., Ntupwa, W.N., Stein, M.R., Munishi, B., Kilungu, H., & Munishi, P. (2016). *Wetland Biodiversity, Livelihood and Climate Change Implications in the Ruaha River Basin-Tanzania*.
- Kariuki M. (2021) *Mainstreaming Traditional Ecological Knowledge in Kenya for Sustainable Development*. African Regional Intellectual Property Organization, available at <http://www.aripo.org/index.php/services/traditional-knowledge> [Accessed on 18/02/2021].



- Kaswamila, A., & Masuruli, B. (2004). The Role of Traditional Irrigation Systems in Poverty Alleviation in Semi-Arid Areas: The case of Chamazi in Lushoto District, Tanzania, Dares Salaam, *REPOA Publications*.
- Kweka, R. (1998). "Women in Smallholder Irrigation in Tanzania", Gender Analysis and Reform of Irrigation Management, Concepts, Cases and Gaps in Knowledge.
- Komakech, C.H. (2013). Emergence and Evolution of Indigenous Water Institutions in an African River Basin: Local Water Community Based and Water Resources Management Reform in Developing Countries. Oxford University Press.UK.
- Kothari, C.R. (2014). *Handbook of Research Methods in Social Sciences* Thousand Oaks, California: SAGE.
- Lankford, B. (2007). Africa: A Framework to Integrate formal and Informal Water Rights in River Basin Management. International workshop on 'African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa', 26-28 January 2005, Johannesburg, South.
- Mosha, D. B., Kajembe, G. C., Tarimo, A. K. R., Vedeld, P., & Mbeyale, G. E. (2016). Performance of water management institutions in farmer-managed irrigation schemes in Iringa rural and Kilombero Districts, Tanzania. *International Journal of Asian Social Science*, 6(8), 430-445.
- Muginya, D.M. (2013). Participation of Local Government Authorities and the Performance of Integrated Water Resources Management in Tanzania: A Case Study of Little Ruaha River, Iringa District. A Dissertation Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Master of Science in Development Policy of Mzumbe University.
- Nguyen, T. H., & Ross, A. (2017). Barriers and Opportunities for the Involvement of Indigenous Knowledge in Water Resources Management in the Gam River Basin in North-east Vietnam. *Water Alternatives* 10, pg. 134–159.
- Oremo, F., Mulwa, R., & Ogue, N. (2019). Knowledge, Attitude and Practice in Water Resources Management among Smallholder Irrigators in the Tsavo Sub-Catchment, Kenya. Centre for Advanced Studies in Environmental Law and Policy, University of Nairobi, P.O. Box 30197, Nairobi 00100, Kenya.
- Ostrom, E. (2010). "The Challenge of Common-Pool Resources". In: *Environment: Science and Policy for Sustainable Development*, 50:4, 8-21.
- Patel, S., Vedeld, P., & Tarimo, E. (2014). Irrigation management, institutions and local livelihood adaptation on Usangu plains, Tanzania. Noragric Working Paper No. 49.
- Richards, N. (2019). Water Users Associations in Tanzania: Local Governance for Whom? Department of Geography, King's College London, Bush House North East Building, London WC2B 4BG, UK; nathalie.richards@kcl.ac.uk.



- Said, S. (2008). *Kiru Valley Complexity: A Case study over Consequences of and Causes to Conflicts over Irrigation Water in Tanzania*. A Master Thesis submitted at Sodertorns University College, Department of Life Sciences: Sweden.
- Saunders, F. (2014). The promise of common pool resource theory and the reality of commons projects. *International Journal of the Commons*, 8(2).
- Tenge, A., & Kaswamila, A. (2001). *The Role of Traditional Irrigation Systems (Vinyungu) in Alleviating Poverty in Iringa Rural District, Tanzania*. Research on Poverty Alleviation (REPOA). Mkuki na Nyota Publishers. Dar Es Salaam.
- United Republic of Tanzania (URT), (2016b). *Guideline for Sustainable Management of Wetlands in Clusters- Dar Es salaam, Tanzania*.
- Van Koppen, B., & Schreiner, B. (2018). *A hybrid approach to decolonize formal water law in Africa* (Vol. 173). International Water Management Institute (IWMI).
- Vatn, A. (2005). *Institutions and the environment*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar.
- World Wide Fund (WWF), (2016). *Wetland Conservation Milestone*. *World Economic Forum*. Gland-Switzerland.