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Towards attaining equity and satisfaction in water allocation mechanism for irrigated agriculture in Northern Nigeria

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Mechanism for water allocation in the irrigated agriculture has been subject of conflict and challenges in sub-Sahara Africa (SSA) due to higher input in rice farming and increasing water shortage. How satisfactory is the allocation mechanism by the stakeholders (the providers, policy-makers and the farmers) and how do farmers perceive equity objective on the existing water allocation mechanism in Nigeria? This paper examines constraints confronting water distribution, farmers' level of satisfaction and their perception on equity in the process of water distribution to farmlands in the Upper Niger River Basin Development Authority (UNRBDA) in Northern Nigeria. This study employs semi-structured interview and validated questionnaires survey approaches with stakeholders. Data collected were analysed using thematic approach based on themes generation and simple descriptive statistics. Findings show that weak institutions, legal framework incapacity and aging infrastructures majorly hinder equitable water allocation in the irrigated agriculture. Varied opinions were observed on the level of satisfaction among the stakeholders. While 77.7% of farmers reported that equity objective is observed, 22.2% declined that there is equity in the allocation policy. Institutional reform and adequate funding for maintenance of facilities is recommended for justice and equity in water allocation.

Key words: Constraint, equity, irrigated agriculture, satisfaction, stakeholders, water allocation.

INTRODUCTION

'Water is life' has become an incontestable slogan all over the world. That is why it is considered as a human right[1] regardless of users' status in the society (Gupta et al., 2010). Despite this fact, water resources management is complicated because it brings about tension(s) whenever one of its fundamentally embedded principles- *access* and *allocation* is tampered with. Whereas there is an established belief that over seventy percent (70%) of water allocation goes to irrigated agriculture in any River Basin Organisations (RBOs) world over (Gourbesville, 2008).

Meanwhile the existing body of literature on water

[1]UN Resolution 60/251, 2010

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sharing mechanisms show that there is no ground theory regarding water allocation practices especially for the irrigated agriculture in RBOs across the globe. However, the question of whether water is being distributed equitably within agricultural sector remains unclear. Nevertheless, the rise in water demand which outweighs supply in the dryer areas during the dry season is premised on rapid population growth coupled with increasing urbanization as a result of economic growth which many African countries are faced with.

Nigeria's water resources are under severe siege due to deteriorating water quantity and quality (Babatolu et al., 2014). Larger outputs in rice production and other agricultural produces in the Sub-Sahara Africa (SSA) come from the Northern region of Nigeria. Prominent location among the major farms in this context is situated in the Upper Niger River Basin Development Authority (UNRBDA). Although, the establishment of the up-to-date 12 River Basin Development Authorities (RBDAs) in the country was to serve the purpose of overall water management at the basin level. On one hand, water allocation technique to different categories of the irrigated rice farmers across the basins in the Northern part of Nigeria is considered lopsided and unsustainable. On the other hand, equity has been neglected within the irrigated agriculture. Presumably the body of literature on equity in water allocation focuses on either Transboundary Rivers or multi-purpose dams serving competing water users (households, industry, hydro-power, agriculture, etc.). Moreover, it has been suggested that "if there is one area where equity is crucial and essential, it should be on the issue of water distribution in the irrigated agriculture[2]. On this note, this paper sets out to examine constraints confronting water distribution in the irrigated agriculture, rice farmers' level of satisfaction and their perception on equity in the water allocation in the Northern Nigeria.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The linkage between institutions and water allocation for agriculture cannot be over-emphasized. As a matter of fact, the need to assess how institutions shape the water allocation practices in any society is paramount to this study.

Institutions and water allocation

Institutions have been defined by many scholars as the rules of game which include laws, policies, regulations and social norms governing human behaviour and structuring the society (Bandaragoda, 2000; Hodgson, 2007). In relation to water resource, Saleth and Dinar (2005) define water institutions as rules which guide actions and provide incentives for individuals and collective decisions regarding water development and management. They submit that water institutions are hierarchical and subjective which are premised on a cultural, social, and political structure of a given society.

For clarity, institutions here refer to formal and informal ones. These two types of institutions have been viewed as 'formal' 'the organized routines of political and constitutional setup; regular elections, legal constraints on actors/stakeholders, and customary laws; while 'informal' institutions as 'the socially shared rules, usually customary which are communicated, and implemented outside the official realm. Both formal and informal institutions are persistent behavioural patterns which are pragmatic productive and advantageous to the society regarding natural resources management (Bandaragoda, 2000; Bratton, 2007; Hodgson, 2007; North, 1990). Moreover, institutions help to understand and analyse the operational responsibility of management functions in water allocation mechanisms (Bandaragoda, 2000; Hooper, 2010). And, physical and hydrological control of water should be completely replaced by "institutional arrangements" through the use of 'storage development' (Gupta and van der Zaag, 2008).

Arguably, both formal and informal institutions are required to tackle the issue of equity in water allocation, especially in the irrigated agriculture scheme. This is because informal institutions are synonymous with 'local rules' which have been confirmed that their application resolve equity issue in water allocation (Komakech et al., 2012). In establishing the importance of institutions in water resources management, some robust policies, laws, and mechanisms are central to water allocation as a means to manage the uncertainty of water resources' sustainability at the basin level. This implies that institutional arrangements require flexibility and periodic reforms regarding water allocation because of variability of water availability over time as a result of climate change, shifting hydrological conditions, and change in land use (OECD, 2015).

Having understood the concept of 'institutions' in water resources management, as defined in relation to this study, it is therefore pertinent to establish that institutions play a dual role in politics of water allocation by shaping human actions towards resources management. These roles of institutions, according to Bandaragoda (2000), could be either of 'constraint or liberation' of human actions in the society pertaining access to water and allocation. Five main factors that can constrain or aid water institutions at river basin level have been identified in extant literature as follows: (1) political system, (2) national economic policies, (3) legal framework, (4) socioeconomic environment, and (5) physical resource base (Bandaragoda, 2000; Heun and Van Cauwenbergh, 2015). According to these authors, these factors are useful because institutions

[2]Stated by Kofi Annan, Former United Nations Secretary-General.

always establish consistent orders in the society to control or checkmate human actions. Furthermore, two major institutional dimensions guiding water resources management at river basin level have been described as physical and non- physical dimensions. The former is related to the scale, quality, quantity, type and location of the water resources, while the latter includes the water users, affecting and affected stakeholders (Bandaragoda, 2000; Heun and Van Cauwenbergh, 2015). Apparently laws, policies and administration serve as the main 'pillars of institutions' which constitute water allocation principles. Institutions managing water resources have been grouped into three major categories. These categories are: water policies, water laws, and water administration (Bandaragoda, 2000; Saleth and Dinar, 2005; Solanes and Gonzalez-Villarreal, 1999).

Therefore institutional arrangements encompass the structure of stakeholders in a procedural and coordinated manner which aids equitable and sustainable use of water resources for agricultural development at the basin level (Bandaragoda, 2000).

Equity in water allocation

Defining equity is a difficult task in itself let alone in water allocation because there are no universally accepted mechanisms for water allocation which is premised on the concept (Wolf, 1998). Whereas, the question of 'equity' is the key objective to water allocation, but, what is equity is difficult to define, measure or determine in water allocation across the globe (van der Zaag, 2007). Despite this odd, the Articles 5 and 6 of the 1999 UN Watercourses Convention highlights its 'equity principles' as "equitable and reasonable utilization and participation". Therefore, Article 5 of the 1999 UN Watercourses Convention defines 'equity' in the context of Transboundary River as "The Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner. In particular, an international watercourse shall be used and developed by watercourse States to attain optimal and sustainable utilization thereof and benefits from that place, taking into account the interests of the watercourse States concerned, consistent with adequate protection of the watercourse" (McCaffrey and Sinjela, 1998; Nigeria, 2014). Article 6 of the Convention stresses that for the achievement of equitable and reasonable utilisation of water, therefore, 'equity' should encompass the following factors:

1. "Geographic, hydrographic, hydrological, climatic, ecological,
2. The social and economic needs of the watercourse states concerned;
3. The population dependent on the watercourse in each watercourse state;
4. The effects of the use or uses of the watercourses in one watercourse state on other watercourse States;
5. Existing and potential uses of the watercourse;
6. Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
7. The availability of alternatives, of comparable value, to a particular planned or existing use" (Gupta, 2015; McCaffrey and Sinjela, 1998).

Despite these definitions by the United Nations, some authors have the opinion that these definitions are descriptive in nature because what constitutes 'equity' differ among the competing water users (Pieter van der Zaag, 2007; Wolf, 1998).The issue of equity requires some criteria to assess and realise water resources distribution among the competing users. Therefore, 'equity' has been defined as the activity of availing every user an equal opportunity for access to water according to one's needs. It is therefore seen that equity does not constitute 'equal quantity' but 'equal opportunity' access to water use (van der Zaag and Savenije, 2014).

Users' accessibility to water in term of affordability and equity have been recognized as a human right by the United Nations General Assembly and United Nations Human Right Council (UN, 2010). Speed et al. (2013) emphasize the concept of scarity, competition and avalaibility while describing the water allocation among the users. On water allocation principle in the river basin, Bernauer (2002) confirms that nearly all the existing studies on specific rivers' management practices are only descriptive in nature. He admits that there is no ground theory for water allocation practices in different river basin organisations. Whereas, water allocation at the river basin level is premised on productive (agriculture, industry, and energy) and social (health and domestic services) purposes and the protection of the environment.

Roa-García (2014) submits that weak legal institutions and transparency have been the major factors hindering equitable, efficient and sustainable water allocation among the users in the basin. She further opines that water allocation is always driven by various levels of power with different interests. She concludes that achieving efficiency for water allocation is more pronounced because is premised on neo-liberalization (full-cost recovery) while equity and sustainability seem unrealistic. In line with, Roa-García (2014), Komakech et al. (2011), and Hillman et al. (2012) argue that water allocation has always been characterized by unknown equity procedures. This is because agricultural growth takes a larger percentage of water at the expense of ecological integrity (environment/natural flow regime). However, they posit that the practice of allocating a larger percentage for agriculture has not proven economic efficiency. Supportively, Jaspers (2015) views

that water allocation depends largely on the principles or systems being practiced in the different countries.

Roa-García and Brown (2015) and van der Zaag (2007) indicate that allocation of water volumes among the farmers in agricultural sector has been found inequitable because the criteria for water allocation are always inconsistent. They concluded that the 'volumetric and administrative' mechanisms for water allocation always neglect ecological integrity. Therefore water allocation should be seen as a 'technical task' which requires transparency and accountability (Roa-García and Brown, 2015). In the same view, the consideration of complete hydrological units is crucial to water allocation which lies in the hands of lowest authorities. The need for flexible allocation mechanisms is required to reconcile "efficiency and equity" principles. In their submission, they identify four major segments of a water allocation system-(1) "water entitlements, (2) water allocation, (3) water delivery, and (4) water use." The most difficult segment among all the mentioned segments is "water allocation''.

Similarly, Speed et al. (2013) identify five major objectives of water allocation that should be in the minds farm operators. They are: (1) equity, (2) environmental protection, (3) priorities, (4) balancing demand and supply, and (5) promoting the efficiency use of water. They conclude that 'equity' is at the central of all but it extremely tough to achieve in water allocation. Arguably, Boelens et al. (1998) therefore, identify the following five levels of equity in irrigation and water management at the local levels:

1. Equitable water distribution and allocation among different water users and uses,
2. Equitable distribution of services involved in irrigation development,
3. Equitable distribution of the added agricultural production and other benefits under irrigation,
4. Equitable distribution of burdens and obligations related to functions and positions,
5. Equitable distribution of the rights to participate in decision-making processes, since this relates to the fundamental issue of whether or not every farmer has rights to speak, vote, claim an entitlement to irrigated land and enjoy equality of status (Boelens et al., 1998).

In order to ensure equity in water allocation on the part of UNRBDA authority, some of the mechanisms put in place are as follows:

1. Irrigation schedule: This is prepared by the UNRBDA and handed over to the farm operators, who are the schedule managers, to allocate and distribute water based on the needs of the Farmers' Association[3].
2. Farm reports: These are prepared by the Basin operators on a monthly basis detailing the achievements and difficulties encountered on irrigated sites and forwarded to the UNRBDA.
3. Use of overhead free boards: This is to take care of water balance to be supplied in case of excess demand by the farmers and water users associations.
4. Participatory irrigation management (PIM): This involves periodic meetings to resolve issues of conflict in water management in irrigation scheme and farm allocation as well as canal maintenance impacting on water equity distribution.

The mechanisms tend to prevent conflict in water management. According to Speed et al. (2013) water allocation planning always focuses on achieving equity as a part of policy objectives of water allocation mechanisms.

METHODOLOGY

This study adopted a pragmatic approach which involves nature of both qualitative and quantitative data, similar to; Ahmed et al. (2013), Mollinga and Gondhalekar (2012), Lorance et al. (2011), and Loucks et al (2005). Hence a hybrid-approach of qualitative and quantitative methodology was employed in this study for better presentation and understanding of the results. Apart from some sets of scientific journals database consulted for the literature review, this study also utilises semi- structured interview, questionnaire and government documents. On one hand, qualitative data was collected through the semi-structured interview administered on the policy-makers, UNRBDA staff (The Operators), and NGOs as well as academia. Some 'code names' were assigned to these three categories of interviewees such as: FGO represents 'policy-makers', UNRB represents 'the water allocators at the basin level' while the 'NGO' represents both the NGO and academia. On the other hand, the quantitative data was gathered through questionnaire on the rice farmers. Interview was conducted with 21 farmers, 18 policy-makers (Ministry of Water Resources, Ministry of Agriculture, and UNRBDA) and 11 Focus Group Discussions (FGD) with the farm operators, academia and Non-Governmental Organisations (NGOs) who are experts in the water resources in Kaduna and Niger states as well as Abuja that the study area covers. A pool of 50 population was sampled which consists of 8 females and 42 males in the study area.

50 Questionnaire (survey instruments) were administered on the farmers in order to gain an insight into wider perception and to ensure triangulation. The survey instruments were developed, subsequent to the interview and validated among 10 farmers. The validation result for internal consistency of the instrument yielded a Cronbach's α of 0.82 and a test-retest coefficient of .075 from a repeated administration of the pilot testing questionnaire during an interval of two weeks. While items relating to influencing factors (constraints) adopted five points Likert scale which ranges from 1 to 5, items that measured equity level from farmers' perspective are ranged from the scale of 1 to 10 from "very poor" to "very high". Concisely, the Table 1 shows the profiles of respondent stakeholders in this study.

Description of study area

Upper Niger River Basin Development Authority (UNRBDA) is the focus of this study. It is a parastatal of the Federal Ministry of Water Resources of Nigeria, with its administrative headquarters in Minna, Niger State (Nigeria, 2004). It was formally known as

[3] UNRB1,UNRB4

Table 1. Breakdown of the population employed in the study area.

S/N	Category	Stakeholders	Designation and gender	Organization
1	One	Policy makers at the federal level	Top officials and heads (4 males and 2 females)	Federal Ministry of Water Resources, Abuja
			Top Officials and Heads (6 Males and 2 Females)	Federal Ministry of Agriculture and Rural Development, Abuja.
2	Two	Decision makers and operators at the basin and state level	Executive Heads (3 Males)	Upper Niger River Basin Development Authority(UNRBDA)
			Head (Male)	
			Agricultural Extension Officers (All Males)	Tungan-Kawo Dam and Irrigation Site, Tungan-Kawo Dam and Irrigation Site
3	Three	End users	Irrigated Rice Farmers (All Males)	Tungan-Kawo, Gurara and Agai/Lapai Dams and Irrigation Sites
			Head of Water Users' Association (Malefarmers)	
4	Four	NGOs and Academia	Units Heads (1 Male and 2 Females)	Maizumbe Farms International, Minna.
				Federal University of Technology, Minna, Niger State

Niger River Basin (NRB) before it was divided into Upper and Lower basins in 1982. This increased the number of River Basin Development Authorities established to twelve (12) under the Decree No. 25 of 1976 (as amended by River Basin Development Authority Act CAP 396 law of the Federal Republic of Nigeria). The basin covers an area of 158,100 km^2 which is located between latitude 7˚N and 12˚N and longitude 3˚E and 9˚E with tropical wet and dry seasons. The basin is drained by Niger River- transboundary river which flows from Mali as the upstream into Nigeria as the downstream country (Andersen and Golitzen, 2005).

Apart from the two major transboundary rivers flowing into Nigeria, the most important national streams drained to the Niger River include; River Kaduna, River Gurara, and River Kontagora. Figure 1 shows the River Niger, and the hydrological location of the study area.

RESULTS AND DISCUSSION

Constraints in water allocation for irrigated agriculture in Nigeria

The starting point in achieving this paper aim is the consideration of the major constraints encountered in the water allocation process from the perspective of the four categories of interviewees. Numbers of constraint are identified during the interpretive evaluative-interpretive strategy adopted in this study. The emergent themes from the data are categorised according to each category of respondents as follows: From policy-makers at the federal ministry level; maintenance problem and lack of institutional capacity building are found to be the major constraints. From the perspective of operational decision makers; inadequate funding, poorly designed canals and drainage system are the major constraints. From the end-users' (farmers) perspective, lack of water pressure/gravity during droughts, inadequate farming machinery, poor maintenance of infrastructure, and climate change are recognised as major constraints. From the NGOs and academia perspectives, climate change, seasonal change, institutional capacity building and mixed use of irrigated dams are recognized as major constraints.

Interestingly, three (3) *major* constraints seemed to come up more frequently based on the responses of the four (4) categories of stakeholders who are the interviewed respondents namely: Institutional capability building, funding and maintenance problems. Regarding institutional capacity building for instance, the existing but outdated Water Decree 101 which was promulgated by the military Government in 1993 needs to be repealed. As aptly mentioned by many of the policy-making respondents that the Integrated Water Resources Management Commission (IWRMC) established newly by the Federal Government solely as the apex body to allocate water licenses to end users is not derived from the Water Decree 101 and therefore does not have any legal backing4(FGO). This implied that its existence is not derived from any enabling law and hence cannot perform its extant functions. Perhaps with the draft of National Water Bill (2015) currently undergoing legislation with the National Assembly, the formulation of an enabling law for this contentious sector would soon be dispensed with. This is further reflected in some of the interviewees' response as quoted below:

I think in my own view, there is a lot to do with maintenance. Our maintenance culture of canal system is

[4]FGO1,FGO2, FGO3, FGO4, FGO5,FGO7

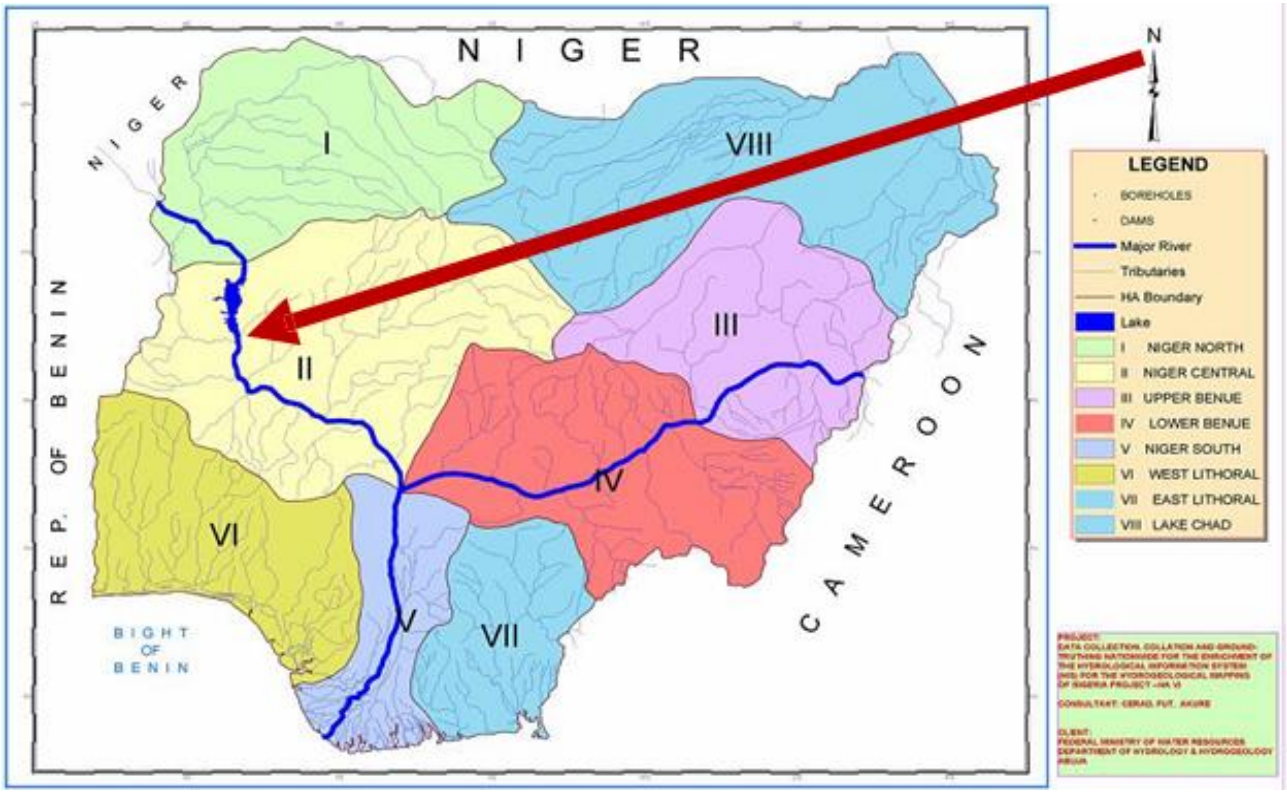

Figure 1. Map showing two transboundary rivers, hydrological areas and drainage systems in Nigeria. Source: FMWR (2015).

under siege, deterioration and on verge of collapse. If something is not done, there will always be problem of equitable water distribution to the users. I mean our farmers. ….If I should tell you now since what specific date these facilities have been replaced, there will be no answer. …though some repair works have been done but not enough to sustain adequate equitable allocation. This really has some effect on the input of the farmers. More still need to be done, I think [Directors; Ministry, UNRBDA, Academia]

Meanwhile, Machethe (2004) points out that insufficient irrigation infrastructure and maintenance contribute to low agricultural development and productivity in the African continent. Furthermore, Food and Agriculture Organisation (FAO, 2004) argues that insufficient irrigation infrastructure and poor operation and maintenance affect irrigation development in Nigeria. In the same vein, farmers in the case study basin also identified climate change as the major constraint affecting the water allocation mechanisms. For examples, many respondents expressed these:

…two years ago when there was not enough rainfall and later led to scarcity or shortage of water[5] *(FGD). "There are no workshops organized by the government to enlighten us on this so that we (farmers) can have strategies to mitigate the climate change scenario (Policy-makers; and Farm operators)*.

Whereas Challinor et al. (2007) and Vermeulen et al. (2012) put forward in their different studies that agricultural production vulnerability to climate change cannot be over-emphasized as the global means temperatures predicts higher by the year 2100. Hence, they suggested two options for climate change mitigation-(1) accelerated adaptation through the use of integrated technology on the part of farmers and institutions managing water sector, and (2) more robust agricultural management risks through the use of awareness creation and 'safety net' (Challinor et al., 2007; Vermeulen et al., 2012).

It is indicated that insufficient funding constitutes one of the major constraints in the process of equitable water allocation to farmers. This is reported in script of the interview as follows:

Stringent budgetary allocation is one of the problems. Let me tell you, in the old time when things were working properly, maintaining and refurbishment of the pour irrigation system was never a problem. But today, funding is a big factor. We often read it in the national daily, the volume of allocation to the sector, but unfortunately, the money never got down to the base.

[5] FGD1,FGD2,FGD3

Table 2. Constraints identified by stakeholders on water allocation system for irrigated purpose in Nigeria.

S/N	Category of stakeholders	Constraints
1	Policy makers at the federal level	Maintenance problem, lack of Institutional capability building, Paucity of funds
2	Decision makers and operators at the basin and state level	Inadequate funding to access water and farm locations, poorly designed irrigated dams, poorly designed canals and drainage system, problem of desilting (accumulation of silt)
3	End users (Farmers)	Lack of water pressure/gravity during droughts, inadequate farming machinery, poor maintenance of infrastructure, climate change and greed of co-farmers.
4	NGOs and Academia	Climate change, seasonal change, institutional capacity building, mixed use of irrigated dams

So, what can one do without money? These facilities and infrastructure are capital intensive which implies that to sustain them, there is needs for adequate funding [Directors; Ministry, UNRBDA, Academia].

In buttressing this view, Komakech et al. (2011) opine that water allocation often faces different challenges such as variability of rainfall distribution, insufficient storage capacity and financial strength among others. They argue further that the inability of a basin to expand its storage capacity always hinders water allocation for irrigated agriculture sector, especially during dry seasons which is attributed to insufficient funding.

Against the aforementioned constraints; poor maintenance culture, climate change and insufficient funding, most of the respondents maintain that these are attributed to the problem of lack of institutional capacity building:

Based on my own years of experience, i can say that there is a need to define institutional roles. What I mean is that the situation of overlapping roles and responsibilities should be addressed….. Duties of parastatal and sectors should clearly be defined. And competent workforce who is trained in specific aspect of water resources management and services should be given chances to utilise their expertise….. Conflict should be avoided through a clear scope of services. You will agree with me that reform of our institutional structure will go a long way to resolve this recurrent problem. Because, if there is no appropriate or efficient legal instrument, there could not be efficient performance. So, I think I will suggest that our legal system on water should be reformed for improvement [Directors, farmers and Academia].

Roa-García and Brown (2015) indicate that allocation of water volumes among the farmers in the agricultural sector has been found inequitable because the criteria for water allocation are always inconsistent. However, Roa-García (2014) submits that weak legal institution and transparency have been the major factors hindering equitable, efficient and sustainable water allocation among the users in the basin. Differently viewed, Boelens et al. (1998) argues that equity should not be seen from the pervasive point of view dominated by the West. Rather, each society should be allowed to conceptualize 'equity' in line with their identity, values, economic and political sufficiency.

Table 2 presents the summary of the findings with the overlapping reoccurrence of institutional flaws and poor maintenance culture. Constraints are varied and can be summed together as representing stumbling-block to equitable water allocation process for irrigated agriculture in Nigeria.

Level of satisfaction on water allocation

Having examined the constraints that confront water allocation process in irrigated agriculture in Nigeria, the extent to which satisfaction on water allocation in the basin is considered. To examine the level of satisfaction on water allocation among the farmers, section of the items in the instrument involved in the computation of level of satisfaction on the distribution of waters to farmers are included. These items were scored in such a way that a "very high" response was scored 5, "high" response was scored 4, and "low" response was scored 3 while a "very low" response was scored 2 and a "neutral" response was scored 1. The resulting scores in each of the items were cumulated to build a mean measure of equitable water distribution in the context of three stages in the dry season of rice production in the study area. The resulting values are categorised into "high satisfaction level" for any score on the satisfaction measure that are greater than 3.14 (mean value of the computation, x), "moderate satisfaction" for any score around the range of 3.14 and "low satisfaction" for any score below 3.14. Table 3

Table 3. Assessment of farmers' satisfaction on equitable water allocation within the production year.

Dry season irrigation stages	1(%)	2 (%)	3(%)	4(%)	5(%)	Mean value (x)	Ranking
BOS	4(19)	3(14)	5(24)	5(24)	4(19)	3.09	3
MOS	4(19)	3(14)	5(24)	4(19)	5(24)		
EOS	0(0)	7(33)	6(29)	5(24)	3(14)	3.19	1

BOS, Beginning of season within a year; MOS, middle of season within a year; EOS, end of season within a year.

Table 4. The chi-square (x^2) test of level of satisfaction of the stakeholders.

Test	Value	df	Asymptotic Sig. (2-sided)
Pearson chi-square	10.000[a]	8	0.265
Likelihood ratio	9.503	8	0.302
N of valid cases		5	

a. 15 cells (100.0%) have expected count less than 5. The minimum expected count is 0.20.

presents the descriptive analysis. In the table, it is shown that at the beginning of the dry season, equitable distribution of water is low at 3.09. The reason for the low level of satisfaction might not be far from the fact that higher volume of water is usually needed by the farmers at the start of rice production season. Towards the middle stage of the production, the distribution is at the moderate satisfactory level, while at the end of the season, farmers' satisfaction with the distribution is high. The reason for the latter outcome might not be far from the fact that less quantity of water is usually needed at the tail end of the season.

Generally, the level of satisfaction with the present decision-making process for water allocation varies across the three (3) Focus Groups: UNRBDA, Academia and NGO(s) and the Policy Makers. When respondents were asked to rank their level of satisfaction on a 1-10 point rating scale, (with very poor assigned a score of 1-2; poor rated as 3- 4; fair as 5-6; high as 7-8 and very high rated as 9-10) the FGD1 ranked their level of satisfaction as 7 which equates to high; FGD2 on the other hand assigned a score of between 8 and 9 for their satisfaction level, which depicts very high ranking level. Interestingly, the FGD3 who are the farmers are also in consensus with the ranking by FGD1 and therefore ranked their level of satisfaction at 7 over 10 which implies a high level of satisfaction. It must be noted however that out of 18 farmers in this group, 55.70% (10) strongly agreed they are very highly satisfied, while 22.30% (4) respectively agreed that their level of satisfaction can be ranked high and fair respectively.

Apart from the FGD 3, most of the respondents from the Federal Ministry of Water Resources and Federal Ministry of Agriculture and Rural Development ranked their satisfaction level with the present decision-making for water allocation 7 out of 10 (high) while UNRBDA ranked it 9 from 10 (very high).

Given the varied responses across these respondents, chi-square (χ^2) test was employed to determine whether the level of satisfaction vary statistically across the categories of respondents or occurred mainly by mere chance. Table 4 presents the result of the Chi Square (χ^2) test for the level of satisfaction across the categories of the interviewees.

The result of the Pearson Chi-Square (χ^2) statistic = 10.000, df = 8, p> 0.05. This implies that there is no enough evidence to show that the level of satisfaction differs among the respondents. In other words, we can be confident that the stakeholders' level of satisfaction with water allocation decision-making process is either high or very high. This leads to the tested hypothesis below.

Null hypothesis (H0): There is no statistically significant difference in the level of satisfaction across the categories of stakeholders based on the existing water allocation practices.

Perception on equity of water allocation among the farmers

In view of the fact that water is a congestible and non-excludable public good that produces services for its users, the issue of equitable distribution within the water allocation process becomes increasingly important. Against the background that equity is central to the end users in the water allocation process; the responses of the farmers were given utmost consideration. In this regards, out of the 21 farmers surveyed, 44.40%(9) strongly agreed, 33.30% (7) agreed, while 11.10% (3) both disagree and strongly disagree respectively that water allocation based on the existing decision-making process is equitable. In

addition, 83.3%(19) of the farmers opined that water allocation based on the existing decision-making process is based on their needs; 5.60% (1) responded that it is based on a proportion of their farm size while 11.10% (2) are largely undecided on this issue as they have no idea of the rationale for equitable water allocation in the study area. Hence, water allocation mechanism is based on the existing decision making process.

The existing allocation system originally intended to serve as check in order to prevent conflict in water allocation. It was also designed to ensure equity in water allocation process in relation to irrigation schedule, farm reports, use of overhead free boards, and participatory irrigation management.

1. Irrigation schedule: This is prepared by the UNRBDA and handed over to the Basin Operators, who are the schedule managers, to allocate and distribute water based on the needs of the Farmers' Association[6] (UNRB).
2. Farm reports: These are prepared by the Basin operators on a monthly basis detailing the achievements and difficulties encountered on irrigated sites and forwarded to the UNRBDA.
3. Use of overhead free boards: This is meant to take care of water balance to be supplied in case of excess demand by the farmers and water users associations.
4. Participatory irrigation management (PIM): This involves periodic meetings to resolve issues of conflict in water management in irrigation scheme and farm allocation as well as canal maintenance impacting on water equity distribution.

Supportively, Speed et al. (2013) argue that water allocation planning always focuses on achieving a set of policy objectives. These policy goals include; equity, environmental protection, economic priorities, balancing demand and supply, and efficiency in water use which results to sustainability.

Arguably, Roa-García and Brown (2015) indicate that allocation of water volumes among the farmers in the irrigated agriculture has been found inequitable because the criteria for water allocation are always inconsistent. However, Roa-García (2014) submits that weak legal institution and transparency have been the major factors hindering equitable, efficient and sustainable water allocation among the users in the basin. Differently viewed, Boelens et al. (1998) argue that equity should not be seen from the pervasive point of view dominated by the West. Rather, each society should be allowed to conceptualize 'equity' in line with their identity, values, economic and political sufficiency. Boelens et al. (1998) therefore, identify the following five levels of equity in irrigation and water management at the local levels:

1. Equitable water distribution and allocation among different water users and uses,
2. Equitable distribution of services involved in irrigation development,
3. Equitable distribution of the added agricultural production and other benefits under irrigation,
4. Equitable distribution of burdens and obligations related to functions and positions,
5. Equitable distribution of the rights to participate in decision-making processes, since this relates to the fundamental issue of whether or not every farmer has rights to speak, vote, claim an entitlement to irrigated land and enjoy equality of status (Boelens et al., 1998).

CONCLUSION AND RECOMMENDATIONS

In this study constraints that confront water allocation, farmers' level of satisfaction with water distribution to their farmlands, and achievement of equity as emphasized in the UN (2010) and Beail-Farkas (2012) reports were examined. Consequently, it was found that weak water institutions, legal framework incapacity, and aging infrastructures coupled with lack of maintenance, majorly hindered the equity for water allocation in the irrigated agriculture in the Northern part of Nigeria. However, varied opinions were observed on the level of satisfaction among the stakeholders with the highest mean value recorded at the end of rice production season in the area, while the lowest mean value was recorded at the beginning of the season. While 77.7% of farmers reported that equity objective is observed, 22.2% declined that there is equity in the allocation policy. This implies that there is seasonal variation Vis-a-Vis water requirement for farming and the value supplied by the basin authority. Thus, it calls for policy reform. Against the foregoing observations, the following recommendations need to be put in place for the irrigated agriculture development in Nigeria in order to address the issues of institutional challenges, which impacts deeply on decision making for water allocation as identified and the problem of maintenance especially on the aging infrastructure.

Starting from the policy-makers' perspective on improvements towards equitable water allocation, formidable institutional arrangements have been suggested to improve the influence of the disadvantaged stakeholders in decision-making process[7] (FGD1). Many of the policy-makers interviewed during the fieldwork in Nigeria submitted that institutional arrangement is a tool to get stakeholders involved which will in turn increase equity in water allocation achievable and make the smooth running of water resources management[8]. For instance, inadequate farming machinery mentioned as a constraint by all the farmers interviewed has alluded to weak

[6] UNRB1,UNRB4

[7] FGD1

[8] UNRB4,FGO1,FGO3

institutional arrangements. This is buttressed by this submission of some respondents:

In the country now we have Integrated Water Resource Management Commission (IWRMC), but up till now it is yet to be ratified by the law to be able to carry out its regulatory services. It only leans on the law establishing the Federal Ministry of Water Resources (FMWR) to carry out water allocation for various uses (Policy-makers, and Academia).

This view is supported by the FAO, which opined that inadequate maintenance has led to low capacity utilization and water logging in the irrigation system of Nigeria.

In addition, practical step towards institutional reforms and adequate funding for maintenance of facilities in order to optimally exercise justice and sustain equity in water allocation for the irrigated agriculture in Nigeria is imperative. Clear definitions of the powers of each of the institutions operating in the water sector, to remove situation whereby multiple agencies have authority and power over the same functions is required. Lastly, the idea of collaboration with private organization can be of help for efficient delivery.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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