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Review

Physical planning administration in Nigeria: Abia State experience

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Man from creation was endowed by nature with the ability of physical planning qualities. From the onset, man was able to organize and order his settlements to provide food and shelter and equally to trade among other benefits. These rudimentary influences that shaped settlements in the early times were later overwhelmed by the backlash effects of growth in population, sprawling and ribbon developments and poor environmental sanitation. This spontaneously called for the need for conscious space ordering and control through physical planning. In this paper, a chronicle of various processes of physical planning administration in Abia State, the progress made so far, difficulties encountered and the defaults associated with the processes is examined. Recommendations were also advanced to highlight the way forward in the effective physical planning administration in Abia State.

Key words: Physical Planning Administration, Organogram, LUAC and LAAC.

INTRODUCTION

Man had the innate abilities to plan. The art of planning was imbued in him by nature. Right from the beginning of times, God created land, water, air and all that are in them and finally created man with a definite responsibility to superintend over the activities that take place in His creation. The history of physical planning could be traced to man as he arranged his settlement orderly and conveniently around the traditional rulers' palaces and worship places. Common rallying centres were maintained for meetings and decision making. Over time, man initiated settlements along the roads, trade and market routes. Early enough, he imbibed the tenets of local customs and practices which culminated in the traditional land tenure system. This engendered land ownership and expansive

developments that spontaneously generated the common responsibility for development control of their settlements and communities.

This is perhaps one of the primary factors that gave rise to legislations that informed physical planning administration in Nigeria. The evolutionary trend of physical planning in Nigeria started with the Lagos Town Improvement Ordinance of 1863 to control poor sanitation and development in Lagos, followed by the 1917 Township Ordinance which expanded its horizon to entire Nigeria. Then came the Nigerian Town and Country Planning Ordinance of 1946 that reeled off the processes of a wide-range of physical planning activities (Oyesiku, 2004). This retained a tailor-made regional derivative of

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the ordinance for the North, East and West. In 1992, physical planning in Nigeria had grown into sophistication.

Accordingly, a more expansive indigenous Nigerian Urban and Regional Planning Law CAP 88 of 1992 was enacted and was further amended as Decree No.18, of 1999. This law was robustly couched to assign responsibilities to the three tiers of administration in Nigeria, classified as the Commission for the Federal, Board for State and Authority for Local Government Areas. Abia State proactively rested on this national law and enacted the Abia State Planning Board and Planning Authority law CAP 38 vol. II, 1999-2000. This law formed the basis for the public notice of March 7, 2006 that reorganized and gave more impetus to physical planning administration in Abia State. This Public Notice in line with CAP 38 increased the number of Town Planning Authorities in the State from eight to fifteen. By this reorganization, Town Planning Authorities assumed full responsibility for the supervision of town planning matters in Abia State. At this time the two remaining Local Governments and the part of Ikwuano LGA that is contiguous to the Capital Territory were still being controlled by Umuahia Capital Development Authority. The enactment of Abia State Planning Board and Planning Authority Law CAP 38 leveraged the advancement of physical planning administration in Abia State.

Agbola (2007) conceptualized physical planning as an activity which is concerned with the guidance and control of systemic change within the physical environment. Further, he noted that in practice, physical planning comprises the formulation of plans and policies for the anticipated changes in the physical environment that are considered desirable and necessary and also those that should be prevented.

Falade (2003) lent credence to this assertion by positing that physical planning entailed putting in place a system of controls either to allow for those changes which are in accordance with plans and policies or to prevent those that are not, from taking place.

Alabi and Akinbode (2010) emphasized that physical planning is concerned with the design, growth and management of the physical environment in accordance with a predestined guide and policies. They further noted that the goal of physical planning is to make provision for the coordination of all forms of development activities at the national, regional and local level.

In other words, physical planning is designed to regulate the activities in the environment with the aid of defined plans and proposal for the purposes of achieving the present and future orderliness, congruence, and harmony. In essence, this calls for purposeful administration of physical planning practices in our settlements, communities and environment at large.

According to the New International Webster's Comprehensive Dictionary (2010), the word administration succinctly means management of public affairs. The conception of public affairs in this context connotes an

aspect of administration which physical planning is conveying at the micro, semi-macro and macro levels; within the local, state and national realms. At the local level, it is for the preparation and administration of towns, rural area, local and subject plans; the state level for the generation and administration of regional, sub regional, urban, local and subject plans. At the national level, it is for the preparation and administration of national physical development, regional, sub-regional, urban and subject plans (The Nigerian Urban and Regional Planning Law Decree No. 88, 1992 and decree No. 18, 1999).

Consequently, Fadare (2004) stressed that the primary function of an administrative framework for planning is to control the use of land, and the character and arrangement of buildings so as to achieve and secure convenience and beauty. Accordingly, its purpose is to harmonize the human external and internal environment to invariably promote healthful and comfortable living.

BRIEF HISTORY OF PHYSICAL PLANNING ADMINISTRATION IN THE UNITED KINGDOM, UNITED STATES OF AMERICA AND NIGERIA

United Kingdom (UK) has a planning system that is responsible for town and country planning devolved to the Welsh Assembly, the Scottish Parliament and the Northern Inland administration. The roots of the UK town and country planning system created in the post-war years lie in concerns developed over pollution, urban sprawl and ribbon developments. These were the offshoots of industrialization and urbanization of the 1940 (Department of the Environment, 1988a; Ekop, 2007).

The major framework for physical planning in UK was set in the Town and Country Planning Act, 1947 which essentially had remained the same till date. This centralized system of physical planning was variously criticized by Corkindale (2004) because of its slow speed and lack of predictability of planning decisions and Barker (2006) on the grounds of its high costs.

According to Kayden (2000), United States of America (USA) country-specific blend of constitutional, historical, cultural and economic ingredients favour local physical planning system. The relative dominance of private property ownership, private market ideology and private sector economy foster a strong opposition to centralized physical planning administration in USA. Consequently, physical planning system in USA is tied to zoning and subdivision regulation.

As a colony of UK, Physical Planning in Nigeria initially towed the centralized planning practices of the British as enunciated in the 1946 ordinance. However, the enactment of Decree 88 of 1992 as amended in Decree 18 of 1999 conceived planning as practised in USA. This is the decentralization of physical Planning in Nigeria with emphasis on the Planning Authorities that favours bottom-top approach.

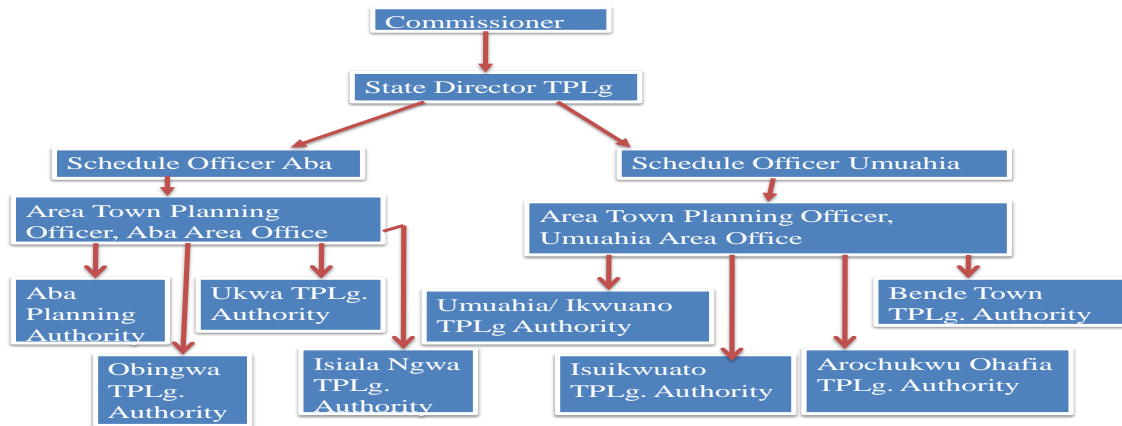


Figure 1. Organogram showing physical planning administration at the creation of Abia State. **Source:** Ministry of Physical Planning and Urban renewal, 2014.

In Nigeria, the Lagos Town Improvement Ordinance of 1863 was essentially the first planning related legislation. The promulgation of this ordinance by the colonialist was informed by the poor state of sanitation in Lagos. It was with a view to control development and poor urban sanitation in this environment. However, the entrenchment of physical planning in Nigeria by the colonialist climaxed with the enactment of the Nigerian Town and Country Planning Ordinance of 1946. This was the period Nigeria was politically partitioned into three quasi-autonomous administrative regions referred to as the North, East and West. As such, this ordinance reordered the planning, re-planning, improvement and development of different parts of the country. The 1946 ordinance covered diverse areas of physical planning activities. Such areas are: Planning Schemes, Execution of Schemes, Acquisition and disposal of land for scheme as well as compensation and betterment. Other areas are the legal procedures for the operations of schemes and financial matters for successful implementation of the schemes.

The major interest of this ordinance was improvement and development control through planning schemes prepared by the Planning Authorities appointed by the Governor-General. The ordinance remained the operative physical planning law in 1960 when Nigeria became an independent and up to 1992 when the Nigerian Urban and Regional Planning Act, No.88 was promulgated. This 1946 ordinance was the first legislative document that provided an all-embracing guidance and focus for the administration of physical planning activities in Nigeria. At independence, the 1946 Town and Country Planning Ordinance was retained as Town and Country Planning Laws, Chapter 123 of the laws of Western Nigeria, Chapter 130 of the laws of Northern Nigeria and Chapter 126 of the laws of Eastern Nigeria. The regional variation of the ordinance introduced variegated approaches to physical planning problems in the three regions due to

increased urbanization experienced in Nigeria soon after independence. This invariably created a set back on the overall development of Nigeria at large.

Physical planning administration at the creation of Abia State

Abia State inherited Aba and Umuahia Area Town Planning Offices from Imo State at its creation by the Federal Government of Nigeria on 27th August, 1991. Aba Area Town Planning Office (ATPO) was controlling Aba Planning Authority, Ukwa Town Planning Authority, Obioma Ngwa Town Planning Authority and Isiala Ngwa Town Planning Authority. Umuahia Area Town Planning Office (ATPO) was in charge of Ikwuano/Umuahia Town Planning Authority, Bende Town Planning Authority, Isuikwuato Town Planning Authority (formerly Isuikwuato/Okigwe in Imo State) and Arochukwu/Ohafia Town Planning Authority. The Area Town Planning Officers supervising Aba and Umuahia Area Town Planning Offices had their offices in Aba and Umuahia from where they intermittently visit the Town Planning Authorities in their jurisdiction. Figure 1 shows that a total of eight Town Planning Authorities existed then, made up of four under Aba Area Office and four also under the control of Umuahia Area Office.

However, the ATPOs generally depended on the reports of field activities submitted to them by the field workers deployed in these Planning Authorities. The Schedule Officers at the headquarters (ministry) supervise the activities of the Area Town Planning Officers by scrutinizing their monthly situation reports, financial returns and other submissions. Thereafter, the reports are presented to the Director of Town Planning who in turn report to the Commissioner responsible for the Ministry of Lands, Survey and Urban Development.

At this material time, the main activities performed by

the Town Planning Authorities were development control, collection and processing of building plans. The Area Town Planning Officer forwards the processed plans for approval by the Chairman of Local Government Areas where the Town Planning Authority covered. Design of layouts, framing of planning scheme, opening and grading of roads in the layouts, were functions jointly performed by Planning Authorities and the Ministry.

NIGERIAN URBAN AND REGIONAL PLANNING LAW NO. 88 OF 1992 AND CREATION OF ABIA STATE

This law was expected to reinvigorate and reengineer physical planning administration and practice in Nigeria, because, for the first time, defined and specific physical planning responsibilities were assigned to the Federal, State and Local Governments of Nigeria. The Nigerian Urban and Regional Planning Law Decree No. 88 of 1992 has had some of its sections amended by the Nigerian Urban and Regional Planning Law Decree No. 18, 1999. Such sections are 6, 8, 10, 86, 87, 91 and the insertion of sections 6A and 89A and a new schedule. The essence of this amendment is to ensure effective functioning of the Commission as established in the Decree by dissolving the Urban and Regional Planning Division of the Federal Ministry of Works and Housing (The Nigerian Urban and Regional Planning Law Decree No. 18, 1999 (Amendment)). The Nigerian Urban and Regional Planning Act No 88 which repealed the forty-six year old and outlandish Town and Country Planning Ordinance of 1946, was promulgated on 15th December 1992 about a year and four months after the creation of Abia State. This law was actually the first post-independent planning law that tried to address the shortcomings associated with the form of physical planning administration informed by the 1946 Town and Country Planning Ordinance. Its content is a drastic overhaul of the administration of Urban and Regional Planning in Nigeria. Some of the salient elements of Law 88 which were not contained in the 1946 Town and Country Planning Ordinance are that the: National Urban and Regional Planning Commission was established to perform planning functions at the Federal level, State Urban and Regional Planning Board was established for all states in Nigeria and the Federal Capital Territory Abuja, while Local Planning Authority was established for the Local Government to perform planning functions at this level of physical planning administration. Most importantly, the provision in the law for the establishment of a Tribunal gave tremendous fillip to the Nigerian Urban and Regional Planning law.

However, the National approach of this law contradicts the provision of section 40f of the 1999 Constitution which classified urban and regional planning as well as physical development as a residual matter within the exclusive legislative and executive competence of the State. In a Legal suit filed by Lagos State against the Federal Government and 35 other States, the Supreme Court

granted five of seven reliefs sought by the plaintiff (Lagos State) and also nullified several provisions of the Nigerian Urban and Regional Planning Law. This Supreme Court judgment of 13th June 2003 declared that Urban and Regional Planning is constitutionally recognized as the responsibility of the state Government rather than that of Federal or local Government (Federal Ministry of Housing and Urban Development, 2004). This judgment is a major setback on physical planning administration in Nigeria as it created a lacuna between the Federal and State as well as between the State and Local Governments in planning matters.

Abia State Urban and Regional Planning Board and Planning Authority Law CAP 38, Vol. II 1999-2000 (Abia State Experience)

Although the Nigerian Urban and Regional Planning Law No. 88 of 1992 had repealed the Town and Country Planning Ordinance of 1946, its Eastern Nigeria derivative, Town and Country Planning Law CAP 126, of 1963 was still being cited and used for physical planning administration and decision in Abia State until the promulgation of Abia State Urban and Regional Planning Board and Planning Authority Law CAP 38 Vol. II, 1999-2000.

The provision of Nigerian Urban and Regional Planning Law No. 88 meant that every state of the Federation was expected to frame their State laws in consonance with the prevailing state physical planning administration. This has to suit their state physical planning operations, but in tandem with the general framework of the sections of law No 88 dealing with state and local governments.

Abia State Urban and Regional Planning Board and Planning Authority law CAP 38 Vol.II 1999-2000 was signed into law on 28th of May, 1999. Abia State was among the first three states that achieved this feat. Accordingly, the law outlined the responsibilities of the State and Local Governments. It also specified the composition of the Board and Authority and their respective functions. This law clearly states the various departments in the Board and Authority as follows:

Physical Planning and Implementation, Urban Renewal/Upgrading/New Towns Development, Development Control, Administration and Legal, as well as Accounts

The law provided among others that the departments shall be responsible to the Executive Director or the Executive Secretary, as the case may be. The foregoing shows that CAP 38 is very comprehensive and lofty in so many respects. It made the whole of Abia State a planning area and provided the impetus for the establishment of Town Planning Authorities in all the Local Government Areas of Abia State. At present, there are 15 Town

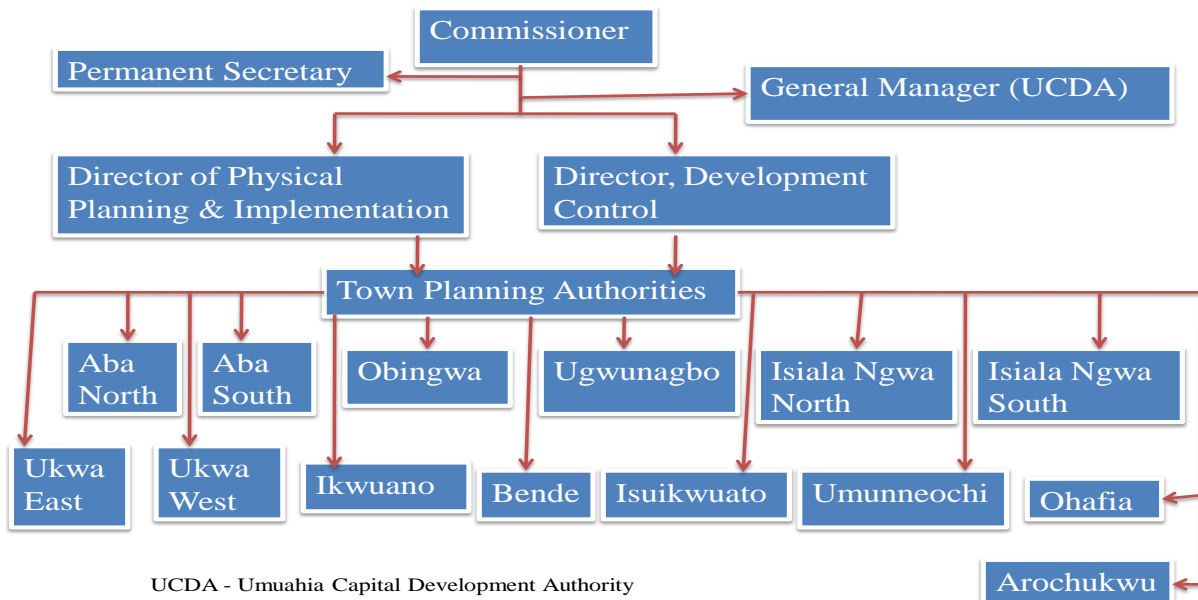


Figure 2. Organogram showing newly created town planning authorities in Abia State. **Source:** Ministry of Physical Planning and Urban Renewal, 2014.

Planning Authorities functioning in 15 Local Government Areas in Abia State.

They are: Aba North, Aba South, Obingwa, Osisioma, Ugwunagbo, Ukwa East, Ukwa West, Isiala Ngwa North, Isiala Ngwa South, Ohafia, Arochukwu, Umunneochi, Isuikwuato, Ikwuano and Bende (Figure 2).

Umuahia Capital Development Authority, the 16th Town Planning Authority, covers Umuahia North and South Local Government Areas as well as part of Ikwuano Local Government Area up to a community called Ngoro. Notwithstanding the good points in favour of CAP 38, it has been discovered that it did not abrogate/repeal Umuahia Capital Development Authority law No 8 of 1992, an older law, during its promulgation. This presupposes that CAP 38 and law No8 are used contemporaneously to deal with physical planning matters that ensue in the Capital Territory. The question is, which of the laws will take precedence?

Furthermore, CAP 38 provides for the establishment of the Board at the state level to be at the apex of physical planning administration in Abia State and dispensing physical planning matters through the five departments earlier enumerated. Up till date, the State Board has not been constituted but virtually all the Departments except the Department of Urban Renewal/Upgrading /New Towns Development have been fully established in terms of functional responsibilities. These Departments are currently operating under the aegis of Ministry of Physical Planning and Urban Renewal contrary to the provisions of CAP 38. In like manner, the Authority was only constituted in 2007 and 2008, thereafter the general policy that should guide the operations of the Authority (the board's function), and the day-to-day management of

the Authority were determined and executed by the Executive and Acting Executive Secretaries. Thus the Ministry through its Development Control Department now supervises the Town Planning Authorities. Even at that, officers at the Headquarters usurp some of the primary functions of the Town Planning Authorities in visiting and inspecting sites without reference to the Executive Secretary in charge of the area. They also conceptualize, initiate and nurture schemes, as well as venturing upon development control activities without the necessary protocol. The essence of creating Town Planning Authorities at the Local Government (grass root) levels with the enabling laws was to ensure a bottom-top approach to physical planning practices. The Nigerian Urban and Regional Planning law and Abia State Planning Board and Planning Authorities law also elucidated the relevance of bottom-top approach to planning. Consequently, Physical Planning practices in Abia State should not only respect the spirit of the laws but also the letters of the laws.

Town Planning Authorities Public Notices

Some efforts were made to create more Town Planning Authorities particularly from the old ones that were composed of two or more Local Government areas. This was not easily achieved as the attempt only succeeded in floating mere information offices or outpost still tied to the whims and caprices of their parent Town Planning Authorities. This State of affairs necessitated the raising of Public Notices that were all gazette for the 15 Town Planning Authorities on 7th March 2006. This exercise was

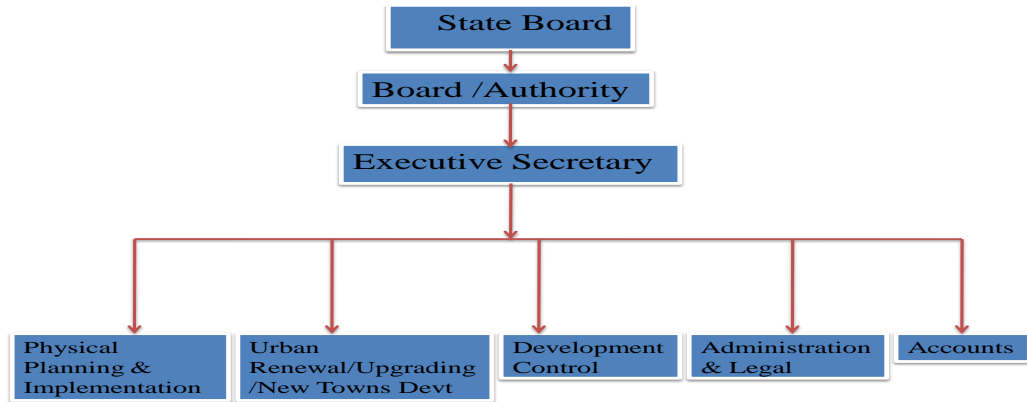


Figure 3. Abridged Organogram of the Town Planning Authority. **Source:** CAP 38, 1999 – 2000.

a Landmark achievement by the then Department of Urban Planning as it gave autonomy and legal statuses to the Town Planning Authorities.

This exercise decentralized physical planning administration in Abia State and made the administrative chain of command and communication simple and effective. In line with CAP 38, Town Planners became the official Heads of Town Planning Authorities instead of the Chairmen of Local Government Councils and politicians. Provision was made for the employment of other professionals such as Builders, Environmental Health Officers, Architects, Civil Engineers, Accountants in the Town Planning Authorities. The offices of the Schedule Officers (Aba and Umuahia) and Area Town Planning Officers (Aba and Umuahia) were scrapped. In the present dispensation, the Executive Secretary doubles as the Area Town Planning Officer responsible to the State Director of Physical Planning and Implementation. This is with particular reference to Area Office matters. The Executive Secretaries are however responsible to the Director, Development Control with respect to development control matters. Figure 2 shows the total number of Town Planning Authorities created by the Public Notice of 2006. The implication is that seven additional authorities representing approximately 88 percent were created.

However, whether the performance of Town Planning Authorities has been commensurate with the genuine and spirited efforts made to stimulate and improve physical planning administration and planning practices in Abia State is a big question staring in our faces. However, experiences discussed below unveiled vivid status report of physical planning practices in Abia State.

Aberrations in Physical Planning Administration and Practices in Abia State

The journey so far has not been easy. It was tedious, rigorous and all the more arduous and tiresome.

Notwithstanding, the promulgation of CAP 38 was a fulfilled dream of town planners in the ministry and the Abia State chapter of Nigerian Institute Of Town Planners (NITP). However, there are some hiccoughs that tend to militate against the speed required to attain the optimum progress in Abia State Physical Planning Administration. These clogs are wide and diverse. They include but not limited to:

INTRODUCTION OF HEAD OF OPERATIONS IN THE ORGANOGRAM OF TOWN PLANNING AUTHORITY

This introduction is not only anomalous but extraneous and illegal. In Figure 3, there is a chain of authority as prescribed by CAP 38. This Organogram shows that at the Town Planning Authority level all Departments are responsible to the Executive Secretary. In Figure 4, there is a depiction of distortion in the Organogram by the introduction of Head of Operations. According to this Organogram, all the Departments in the Town Planning Authority are responsible to the Head of Operations, who by this description acts as the cleaning house and mouth-piece of the various Departments to the Executive Secretary.

This is an unfortunate illegal act and an imposition introduced in 2012 that has been found to be selfish and diversionary to the actual intention of ensuring proper physical planning practices in Abia State. This office is breeding bad blood in the rank and file of staff of Town Planning Authorities. The Head of operations now have an undue advantage over other colleagues and professionals of same ranks. This is because, the head of Operations assumes an unnecessary position of the first-among-equals and generally lords it over other colleagues. The position of the Head of Operations has been criticized extensively by town planning practitioners in Abia State especially on the grounds of illegality. However, it seems that the protagonists of such a position are adamant and undaunted because of the

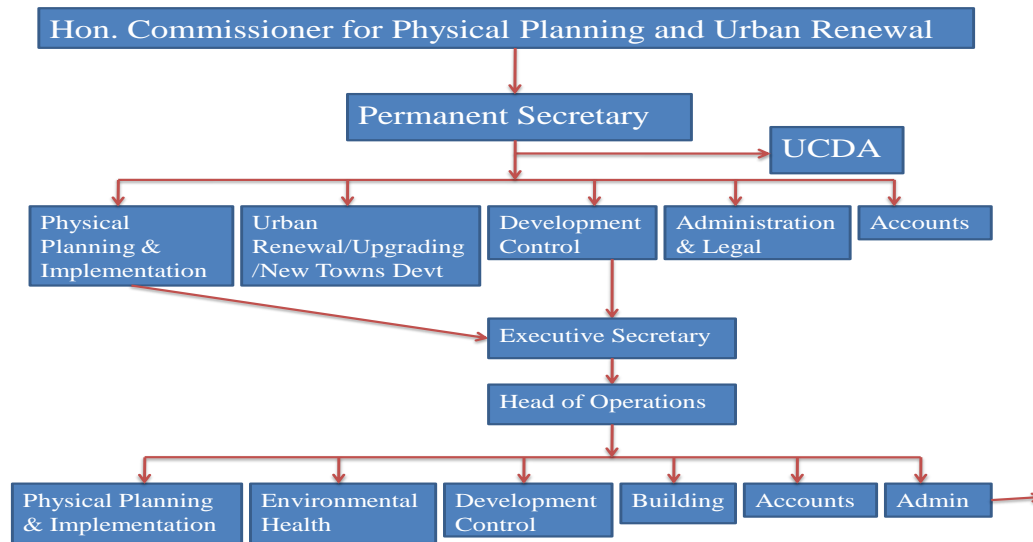


Figure 4. Distortion in the Organogram of Town Planning Authority. Source: Town Planning Authorities in Abia State, 2014.

benefit in terms of gossips and town planning jobs they derived from the head of operations.

Lack of professional staff

By virtue of the prescription of CAP 38, Town Planning Authorities in the State should employ on a conservative scale 45 Professional Town Planners. This number does not include the Town Planning Staff of UCDA. The dearth of professional Town Planners in the Authorities is affecting the administration of physical planning in Abia State. Currently, there are 26 Registered Town Planners in Town Planning Authorities. Whereas in five Town Planning Authorities such as Aba North, Isiala Ngwa North and South, Bende and Ikwuano there are no Registered Town Planners.

Movement of physical planning department from one ministry to the other

A particular experience that has apparently destabilized physical planning administration in Abia State and its relevance in the scheme of things is its transitory movements from one ministry to the other. The centre or hub of Physical Planning Administration in Abia State, former Department of Urban Planning – started its journey as a Bureau in the Ministry of Works in 1992. Later it was established as a Department of Urban Planning in the Ministry of Lands, Survey and Urban Planning. Thereafter, it became a department in the Ministry of Housing and Urban Development and later returned to the Ministry of Lands, Survey and Urban Planning. Sometime in August 2010, it was carved out

from the Ministry of Lands, Survey and Urban Development as the Ministry of Urban Renewal. This Ministry was eventually rechristened the Ministry of Physical Planning and Urban Renewal. This various movement has gravely impinged negatively on the foundation and stability of physical planning administration in Abia State.

Non implementation of master plans, structure plans and elimination of Land Use and Allocation Committee (LUAC) and Land Advisory and Allocation Committee (LAAC) from land use decisions

The major features of the old master Plan for Umuahia prepared by G and G International were not implemented even though it was completed in 1984 seven years before Abia State was created. This is with particular reference to the Ring Road provided in the Master Plan. It was meant to divert traffic that traverses the City Capital away from it and reduce pressure and congestion on the city internal roads. Most unfortunately, there is no master plan for the capital territory up till date. The growth point plans and structure plans inherited from Imo state were not seriously considered as veritable documents that should guide physical planning activities. These documents were stock of the shelves, seldom referred to by officers for the determination of land uses in the affected areas. This made the urban and rural areas as designated by these plans to be hardly distinguishable even at present. This disappointing and dangerous phenomenon was accentuated by the elimination of LUAC and LAAC in the determination of land uses in urban area and rural environments. This has encouraged the tacit and unregulated use of direct application, that does not include adequate scrutiny and

input on certificate of occupancy (C of O) application from town planning point of view. The negative implication of this is that non-compatible and non-conforming uses are found littered in the environment. At times applications for C of O are granted for sites on the roads, open spaces, conserved, preserved areas, and uses contrary to the designation of existing scheme.

Creation of town planning department in the ministry of lands and survey

The establishment of a town planning unit in the Ministry of lands and Survey at the end of February, 2012 has further denied the Ministry of Physical Planning and Urban Renewal one of its statutory functions. Department of Physical Planning and Implementation is by law responsible for physical planning and land use matters. Contrarily, the Ministry of Lands and Survey now supervises the town planning unit and without the requisite education and professional training unilaterally offer unqualified advice that is relied upon in granting approval on land use matters.

The excesses of the Ministry of Lands and Survey are now a big threat to the existence of the Ministry of Physical Planning and Urban Renewal. They have without qualms continuously embarked upon the balkanization and mutilation of existing layouts, created and carved out plots and allocating such to the public without holistic redesign of layouts. Sometimes, the Ministry of Lands and Survey recruit quacks and unprofessional surveyors and inexperienced town planners who do not exhibit any sense of responsibility in the built environment to redesign and tinker layouts.

The former Project Implementation Unit (PIU), now Abia State Estate Development Agency (ABSEDA) does not also help matters. They create mushroom layouts that do not have concepts and standards. These layouts are not subjected to the review of the Department of Physical atmosphere, for the benefit of stake-holders within the ambit of the enabling laws. The increase in the number of Town Planning Authorities from eight to fifteen is a boost on the physical planning administration in Abia State. It is an enviable achievement that should generate a multiplier effect not only in terms of employment of staff but in terms of efficient and prompt service delivery.

Consequently, there is the ardent need to address and right all the aberrations noted in this paper and more, for the overall progress and better functioning of physical planning administration in Abia State.

RECOMMENDATION

The problems raised in this paper may have peculiar shades and colorations in other states in Nigeria. They are however highlighted to reveal the main problems that

are bedeviling the progress of physical planning administration in Abia State. Up till date no reasonable attempts have been made to improve on them, rather physical planning administration is being plunged into more difficult dimensions. For instance, every issue on land is now being piloted by the Ministry of Lands and Survey in exclusion of the Ministry of Physical Planning and Urban Renewal, the goose that should be laying the golden eggs.

Notwithstanding, it is recommended that the post of heads of operation be scrapped from the Organogram of the town planning authorities as it is not only extraneous but illegal. In addition, Abia State Planning Board and Planning Authority Law CAP 38, Vol. 2, 1999 – 2000 did not make any provision for such post. It is breeding bad blood and antagonism among the staff.

Although only one elected corporate member is newly registered professionally, many graduate members are warming up for the Nigerian Institute of Town Planners professional examinations this year. Accordingly, it is expected that the number of Registered Town Planners will increase as the years roll by. Therefore, all graduate and student members should be encouraged to regularly attend state chapter meetings and participate in all chapter activities. This will renew their interest and galvanize efforts necessary for the advancement of physical planning administration in Abia State.

In order to recover loss grounds in the functions of Town Planning Department and to engender fuller involvement of town planning in the scheme of things in Abia State, the town planning staff in the Ministry and those in the private sector should not rest on their oars. The private practitioners should particularly insist that town planners should at all times play the leading roles in all that involves land development and physical planning administration. This they will achieve through courtesy calls on government functionaries, advertisements and proclamations, through seminars and conferences as well as resorting to court actions to seek redress on extreme cases.

The issue of providing a master plan for Abia State has been highly belaboured without success. As a result, the Ministry of Physical Planning and Urban Renewal should through the Town Planning Authorities which are still under their control embark on the preparation of structure plan and private layouts with written schemes. This essentially will control the sprawling and disorderly developments that are emerging in all the Old Urban area in Abia State.

The Town Planning Authorities should undertake tours and visits to the traditional rulers and leaders of thoughts in their areas of jurisdiction and educate them on the needs to order the land in their autonomous communities through the design of private layouts. Also, the discussion on the relevance of providing private layouts at various local government areas should be championed by the local government chairmen. The Executive Secretaries of

the Town Planning Authorities are well able to liaise with the Chairmen to create such awareness at the grass root levels.

All private layouts prepared should be approved with the accompanying written schemes and implemented accordingly. Dotted examples of properly articulated and implemented layouts will serve as awareness and eye openers to the public and encourage the framing of layout plans and schemes in their various localities.

The Land Use and Allocation Committee (LUAC) and Land Advisory and Allocation Committee (LAAC) should be re-established to review and take decisions on the application and approval of Statutory Certificate of Occupancies. This will stem the irregular recommendations and approvals done unilaterally by the Ministry of Lands and Survey and reorder the location of land uses at the recommended sites and appropriate designated locations.

The Town Planning Unit created at the Ministry of Lands and Survey is a rape to the functions of the Ministry of Physical Planning and Urban Renewal. It is an evil wind that has blown physical planning administration in the state no good. This unit should be closed down and its functions and staff returned to the Ministry of Physical Planning and Urban Renewal where it rightly belongs.

The Nigerian Institute of Town Planners Abia State Chapter has been doing a lot in town planning activities through meetings, discussions, and annual luncheons which are veritable and viable fora for education, interaction and dissemination of planning information to members and the public.

The Abia State Chapter should extend its frontiers and further interact and synergize with sister chapters in other states to benefit from novel planning issues they may have at their disposal. This will enhance physical planning administration in Abia State to a large extent and evoke an enduring imprint of new physical planning tenets on the activities of Abia State Chapter.

Conflict of Interests

The author has not declared any conflict of interest.

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Full Length Research Paper

Morphometric characteristics of selected fluvial lakes in the Upper Benue Valley Area of Adamawa State, Northeastern Nigeria

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Bathymetric survey and mapping are important procedures for monitoring temporal changes in hydrogeomorphic characteristics of lakes. This study is the first ever carried out on the lakes, and as such provides relevant baseline information for current use and future studies. The studied lakes (Gwakra, Geriyo, Pariya-Ribadu and Pariya) were purposively selected for the study on the basis of size and relevance. The bathymetric survey was conducted by sounding rod method. Preparation of the Bathymetric Maps involved the application of GIS procedures. Morphometric parameters of the lakes were determined from prepared maps by direct measurements and mathematical computations using appropriate formulae. Information derived from the prepared maps revealed that the lakes are characterized by gentle Basin Slope and almost uniform bottom morphologies with slight ruggedness. Maximum Lengths of the lakes ranged from 0.89 (Pariya) to 3.14 m (Geriyo), while Maximum Widths ranged from 0.34 (Pariya) to 1.52 m (Gwakra). The lakes were also found to be generally shallow with mean dry season depths ranging from 0.40 to 1.33 m and volumes ranging from 0.17 to 1.12 mcm. The lakes were characterized by low Indices of Basin Permanence (0.04 to 0.27), indicating senescence and dominance by littoral plants. Relative depths were also very low (0.07 to 0.42), indicating high propensity of water mixing and circulation of dissolved Oxygen adequate enough to support biological productivity. Thus, the lakes are recommended for substantial fish farming and livestock production in the area. Proper management involving temporal morphological assessment of the lakes based on this study is also recommended for sustainable use.

Key words: Fluvial lakes, hydrographic survey, bathymetric mapping, lake morphometric characteristics.

INTRODUCTION

Lake bathymetric data collection and mapping are very important hydrographic activities, most especially in parts of the world where lakes are regarded with high level of importance for various uses. As a matter of fact, having a

bathymetric map of a water body is an invaluable piece of information that can provide much needed and helpful data for years to come (Aquatic Environment Consultants Inc., 2012). Lake bathymetric maps are similar to

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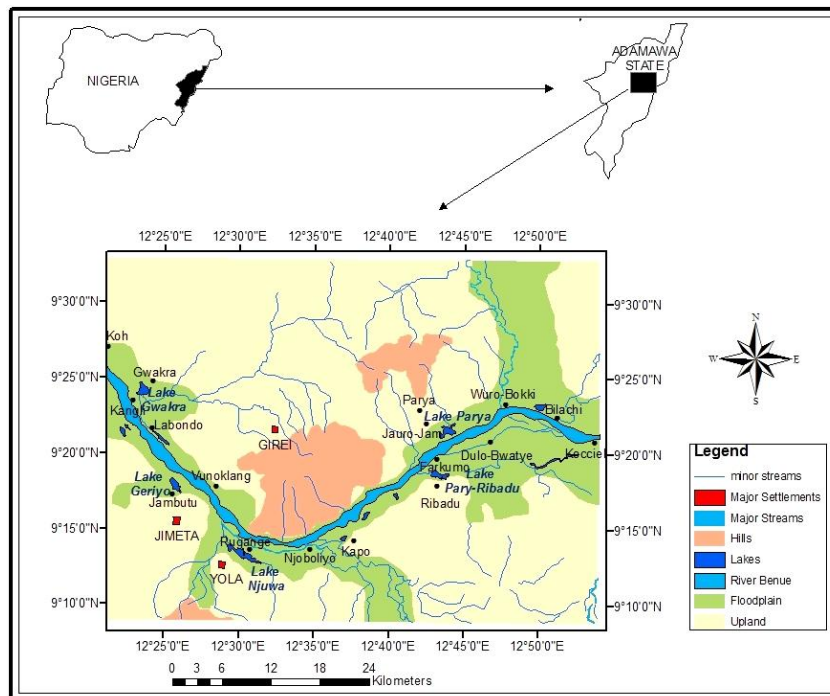


Figure 1. Study area and the lakes.

topographic maps as they provide detailed morphometric information about Lake Basin terrains and their water contents (Cole, 1979; Aqualink, 2012; Florida, 2001). Such maps are useful in the determination of lakes' Surface Areas (A_0) and Volumes (V) which are vital for water management; Relative Depths (Z_r) and Indices of Basin Permanence (IBPs) which help in predicting biological productivity; fetches from all directions and lake bottom morphologies for navigation and fishing and assessment of sedimentation rates (Limgis, 2001; Ayenew, 2009; CT-ECO, 2009). Notably, a special bathymetric survey project of Lake Tahoe was conducted in August 1998 to study the terrain of the lake floor. This activity was aimed at helping scientists identify the materials that make up the lake basin and throwing more light on the basin history hidden by waters of the Lake (US Geological Survey, 2003). In addition, a considerable number of Bathymetric Maps of East African Lakes have been prepared for morphometric and hydrological studies of the lakes (Baxter et al., 1965; Bekele, 2006; Ayenew and Demlie, 2004; Demlie et al., 2007). Since the bathymetric map of a lake can only represent the lake's dimensions at the time of measurement (Ayenew, 2009), changes in the lake's morphological characteristics can be evaluated from subsequent bathymetric exercises. From such changes, sedimentation rates can be deduced.

On the Benue Valley Floodplains of Adamawa State is an assortment of fluvial lakes that support a wide range of activities which include fishing, animal production, irrigation agriculture, recreation, socio-cultural festivities

and domestic uses. Characterized by varied shapes and sizes, the lakes undergo gradual deformations owing to seasonal flooding and sediment deposition on the floodplains. The 2012 extreme flood episode in the Benue Valley resulted in merging of the fluvial lakes into a continuous sheet of lotic water similar to the cases of Middle Parana Floodplain Lakes at periods of high water stages as stated by Drago (1989). At the recede of the flood, some changes in the morphology of the Benue floodplains; which affected the lakes were observed. However, since neither bathymetric information (maps) nor morphometric records of the lakes exist, the magnitude of the flood effects on basin morphologies of the lakes could not be ascertained.

This informs the need of this baseline study. Its findings shall serve as important baseline information for future and related studies that may require Basin Morphology information on the lakes.

The Upper Benue Valley Area of Adamawa State, within which the selected lakes for this study are situated, is located between latitudes $09^{\circ} 09' 00''\text{N}$ and $09^{\circ} 33' 00''\text{N}$ of the equator and between longitudes $12^{\circ} 21' 00''\text{E}$ and $12^{\circ} 54' 00''\text{E}$ of the prime (Greenwich) meridian. The area stretches from Kocciel in Fufore to Koh in Girei Local Governments Areas of Adamawa State, covering a total length of about 76.250 km (Federal Surveys, Nigeria, 1971). The selected lakes include Gwakra ($09^{\circ}24'26''\text{N}$, $12^{\circ}23'38''\text{E}$), Geriyo ($09^{\circ}18'15''\text{N}$, $12^{\circ}25'34''\text{E}$), Njuwa ($09^{\circ}13'15''\text{N}$, $12^{\circ}30'12''\text{E}$), Pariya-Ribadu ($09^{\circ}18'36''\text{N}$, $12^{\circ}43'12''\text{E}$) and Pariya ($09^{\circ}21'17''\text{N}$, $12^{\circ}43'27''\text{E}$), as shown in Figure 1.

MATERIALS AND METHODS

This research focuses mainly on hydrographic survey, bathymetric mapping and interpretation morphometric characteristics of selected Fluvial Lakes in the Upper Benue Valley Area of Adamawa State. The lakes were purposively selected based on their apparent sizes and relevance in terms of multiple uses.

Hydrographic survey and bathymetric mapping

Hydrographic survey of the lakes was conducted in dry season (March, 2013) using Sounding Rod Method based on presumed shallow nature of the lakes (<10.00m) as described by Basak (1994) and Arora (2002). This involved the use of a boat and a leveling staff for depths sounding as well as Germin 76 GPS for determining X and Y coordinates of sounding point. Series of depths (Z coordinates) and their corresponding X and Y coordinates in Universal Transverse Mercator (UTM) projection system were obtained along defined transects in each of the four lakes surveyed. Same X and Y coordinates were obtained round the lakes along their shorelines where depth is zero in order to obtain outlines of the lakes current shorelines.

Bathymetric data processing and map preparation involved the application appropriate Geographic Information System (GIS) procedures. The bathymetric data for each of the lakes were tabulated in Microsoft Excel and saved in Text Tab Delimited Format (TTDF). It was then opened in ArcView GIS 3.2a environment and converted into a Database Format (DBF) and finally exported to ArcMap environment of ArcGIS 9.3 for map preparation. The sounding point events and bathymetric map of each of the lakes were then prepared using spatial analyst tools of ArcGIS 9.3, while 3D versions of the lakes' Basin Morphologies were prepared in the Map Environment of Surfer 10 Software.

Morphometric measurements and computations

Lake maximum Depth (z_m) values were obtained directly by rod sounding, while Surface Area (A_0), Fetch or Maximum Length (l_{max}), Maximum Width (b_{max}) and Shoreline Length (L) values were obtained from the bathymetric maps using the measure tool of ArcGIS 9.3 ArcMap tools bar. Values of derivative morphometric parameters were obtained by computations using the following formulae:

Mean Width $b_{mean} = A_0/l_{max}$ Equation 1 (Wetzel, 2001)

Lake Volume: $V_{z_0-z_1} = \frac{1}{3}(A_{z_0} + A_{z_1} + \sqrt{A_{z_0} \times A_{z_1}})(z_0 - z_1)$ Equation 2 (Cole, 1976; Wetzel, 2001)

Where, $V_{z_0-z_1}$ is volume of truncated part of the lake between the shoreline on depth (z_0) and successive depth z_1 , A_{z_1} is Surface area of lake at depth z_1 .

Mean Depth $z_{mean} = V/A_0$Equation 3 (Wetzel, 2001)

Relative Depth(z_r) in % = $z_r = \frac{50(z_m)\sqrt{\pi}}{\sqrt{A_0}}$ Equation 4a

(Wetzel, 2001)
or simply as

$z_r = \frac{88.6 \times z_m}{\sqrt{A_0}}$ Equation 4b

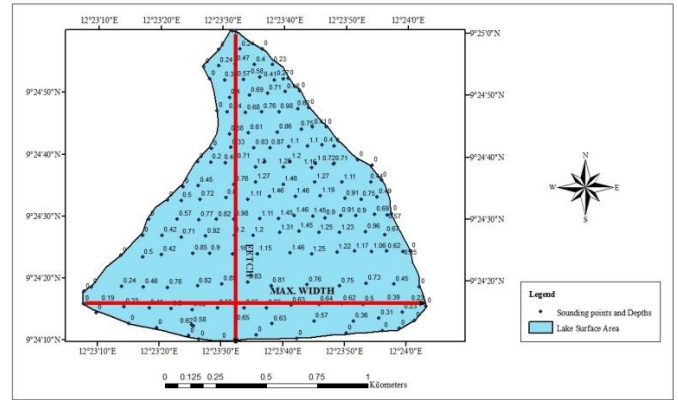


Figure 2. Sounding points for Lake Gwakra.

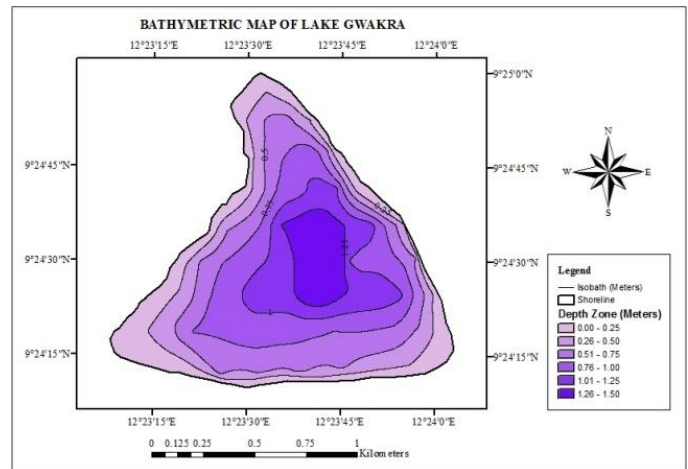


Figure 3. Bathymetric map of Lake Gwakra.

Index of Basin Permanence (IBP) = V/L Equation 5 (Soil and Water Conservation Society of Metro Halifax 2006).

RESULTS AND DISCUSSION

Figures 2, 5, 8 and 11 present information on sounding points events of the lakes obtained during the Bathymetric Surveys, while Figures 3, 4, 6, 7, 9, 10, 12 and 13 provided information on Basin Morphologies of the studied lakes. The varied shape and size characteristics of the lakes as portrayed by the bathymetric maps are tied to the lakes' origin and hydrogeomorphic dynamics of the Benue Valley. The bathymetric maps revealed that the lakes are characterized by regular bottom topographies of almost steady gentle slopes. However, the northeastern part of Lake Gwakra is marked by a sharp steep shore about 1m high giving the lake a steep shore on one side and a gentle shore on the other (Figures 3 and 4). The slight rugged bottom terrain observed in Lake Geriyo could be attributed to urban

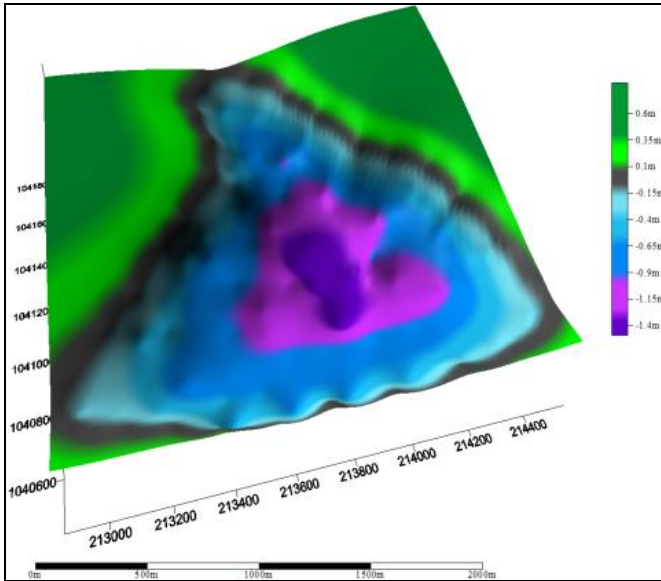


Figure 4. Basin morphology of Lake Gwakra.

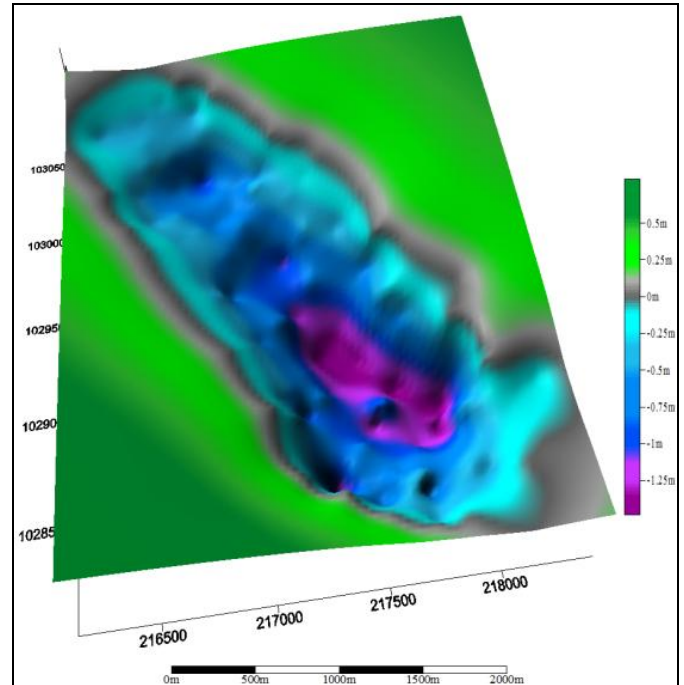


Figure 7. Basin morphology of Lake Geriyo.

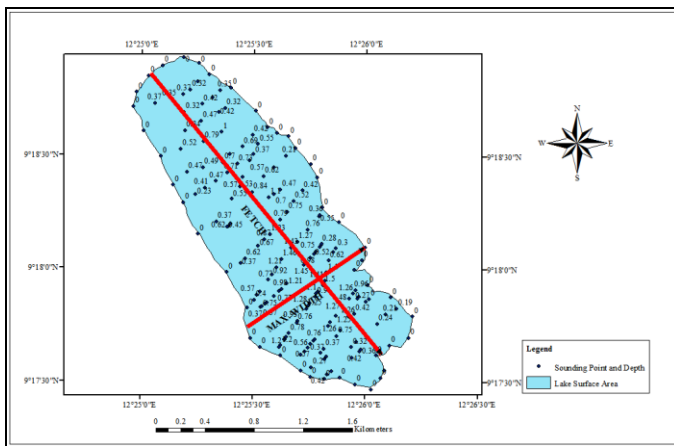


Figure 5. Sounding points for Lake Geriyo.

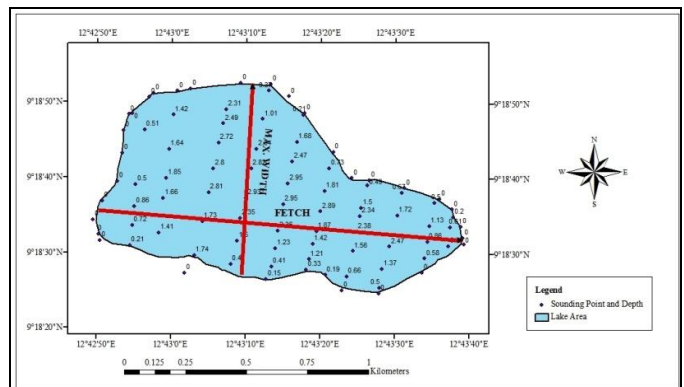


Figure 8. Sounding points for Lake Pariya Ribadu.

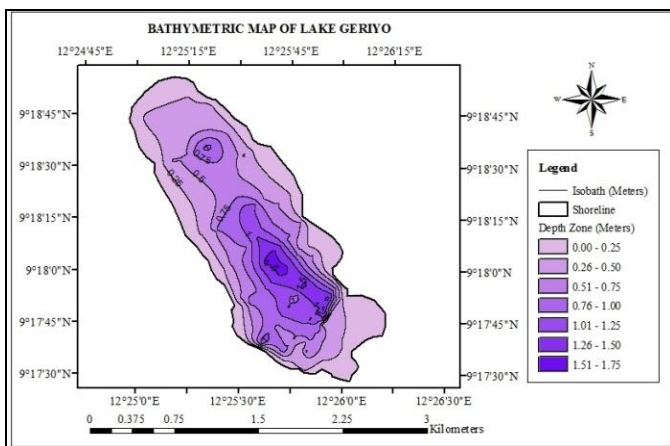


Figure 6. Bathymetric map of Lake Geriyo.

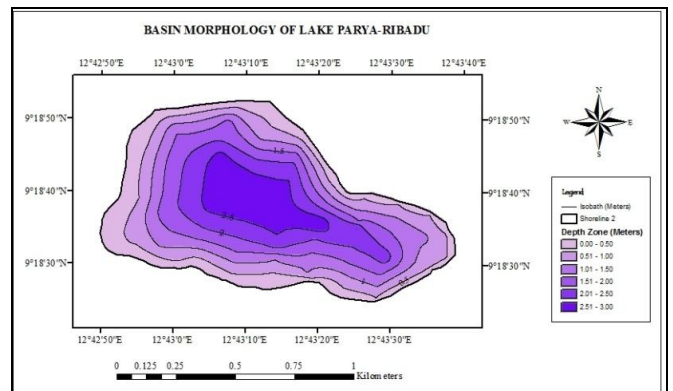


Figure 9. Bathymetric map of Lake Pariya Ribadu.

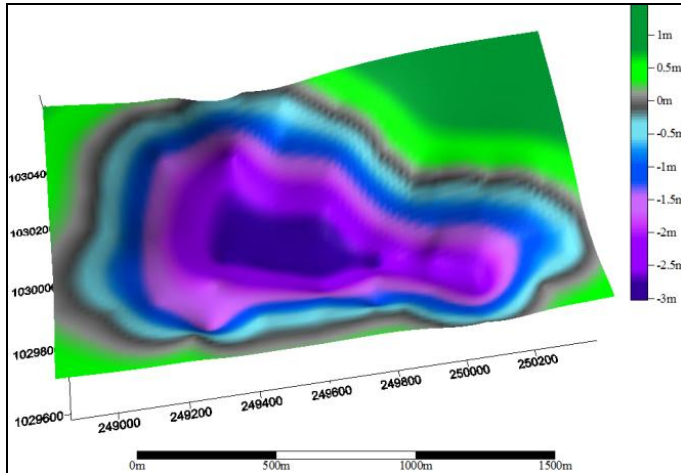


Figure 10. Basin morphology of Lake Pariya Ribadu.

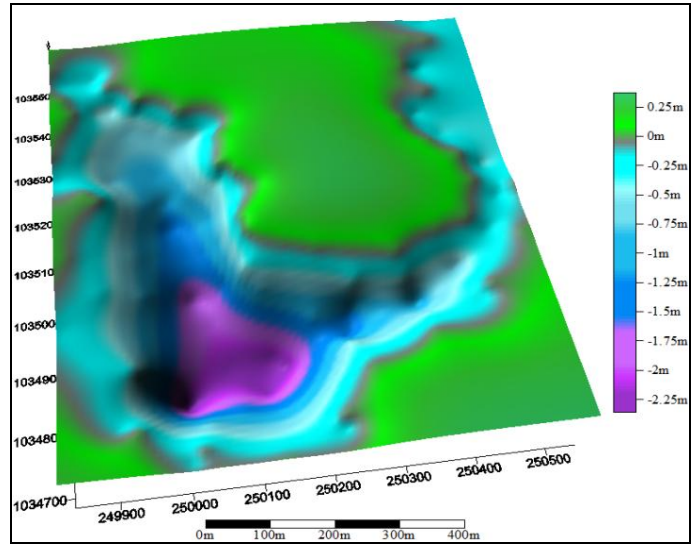


Figure 13. Basin morphology of Lake Pariya

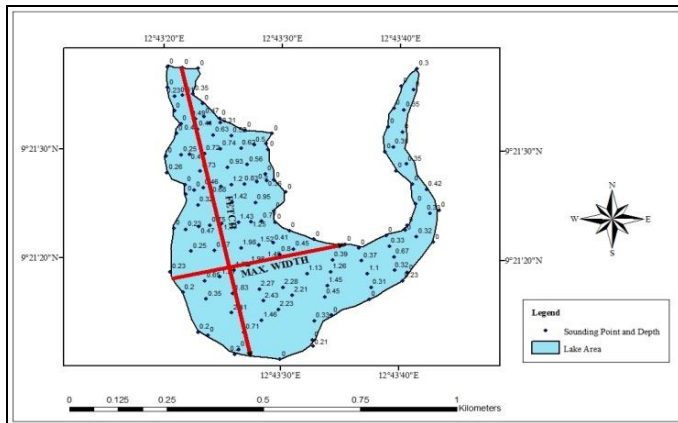


Figure 11. Sounding points for Lake Pariya.

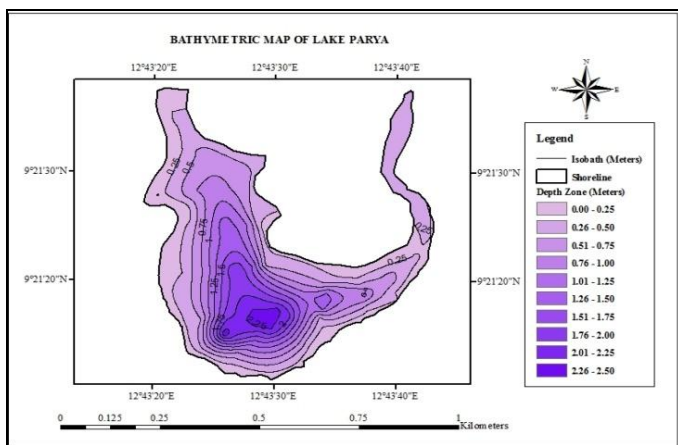


Figure 12. Bathymetric map of Lake Pariya.

irrigation to continual land tillage and waste disposal at different points (Figures 6 and 7). Lake Pariya Ribadu Portrayed a more regular basin morphology in terms of ruggedness owing to less fluvial and human interferences (Figures 9 and 10). Lake Pariya tends to be gentle on its northern part and steeper on the southern part. This indicates that more lake sediments are generated from farm lands north of the lake than from the Benue channel at the south (Figs. 12 and 13).

The morphometric data on Table 1 showed that, Pariya-Ribadu was the deepest of the lakes, having a maximum depth of 2.95 m and a mean depth of 1.41 m; while Lake Pariya had a maximum depth of 2.43 m and a mean depth of 0.79 m. Lakes Geriyo and Gwakra exhibited almost the same maximum and mean depth characteristics (Table 1). However, Lake Geriyo was found to be the shallowest (0.70 m) of the lakes in terms of mean depth characteristics.

Based on field studies, the major factors responsible for variation in depth characteristics of the lakes include downstream slope characteristics of the Benue Valley System, impacts of lakes inlets and differential land activities within and around the lakes. Lakes Pariya-Ribadu and Pariya, situated on the upstream of the studied valley section, exhibited higher maximum and mean depth values than lakes Gwakra and Geriyo situated on the downstream. To a greater extent, this is attributed to more sedimentation on the downstream section of the valley during flooding. Continual sediment load into the lakes basins through their inlets (streams) also contributed immensely to the shallow depths of the lake basins. In addition, large quantities of sediment generated from agricultural (Cultivated and grazing lands) and residential land uses contribute to the shallow depth characteristics of the lake basins.

runoff contributions and intense human activities within and around the lake ranging from excessive pumping for

Table 1. Morphometric properties of study lakes.

Morphometric characteristic	L. Gwakra	L. Geriyo	L. Pariya-Ribadu	L. Pariya
Mean Elevation (m)	151.00	153.00	160.00	162.00
Maximum Length (km)	1.66	3.14	1.53	0.89
Maximum Width (km)	1.52	1.07	0.80	0.34
Shoreline Length (km)	5.22	8.10	3.94	3.84
Maximum Depth (m)	1.46	1.48	2.95	2.43
Mean Depth (m)	0.75	0.70	1.41	0.79
Relative Depth (%)	0.11	0.07	0.29	0.42
IBP	0.16	0.14	0.27	0.04
Surface Area (Ha)	140.66	282.32	81.36	26.43
Volume (mcm)	0.85	1.12	1.08	0.17

**Figure 14.** Lake Pariya depicting senescence and dominance of rooted aquatic plants (*Nymphaea spp.*)

Relative Depths of the studied lakes were found to be generally low, owing to their shallow characteristics in relation to their Shoreline lengths. Lake Geriyo exhibited the lowest relative depth (0.07%), while Lake Pariya-Ribadu had the highest (0.42%). These low relative depth characteristics were observed to be similar to those of most Brazilian lakes as presented by Von (n.d.). Since Relative Depth is a percentage measure of resistance to mixing of lake water (Soil and Water Conservation Society of Metro Halifax, 2006), the low percentages observed indicated that the lakes are exposed high vertical circulation and mixing, adequate enough to aid the transfer of dissolved oxygen and surface temperature conditions to their bottom zones. In addition, Indices of Basin Permanence (IBPs) for the lakes were also very low (Table 1). This indicates how senescent the lakes are in terms of easy penetration of sunlight to their basin floors, which in turn aids high dominance by rooted aquatic plants such as *Nymphaea spp.* The effect of this

parameter is more eminent in Lake Pariya with an IBP percentage of 0.04 (Table 1 and Figure 14). The combined effects of low Relative Depths and IBPs of the lakes are responsible for the occurrence and functioning of vast biological activities ranging from growth of varied aquatic flora to the existence of vast aquatic fauna species.

Relationships between depths and surface areas of the lakes are presented by the hypsographic curves plotted (Figures 15 to 18). It was deduced from the curves that at depth of 1.0 m from the surface (0m mark), changes in surface area of Lake Gwakra are bound to remain within a range of 13.37Ha to 140.66Ha or even more; 22.78 to 283.23 Ha for Lake Geriyo; 48.89 to 81.36 Ha for Lake Pariya-Ribadu; and 7.29 to 26.43 Ha for Lake Pariya. Analysis from the hypsometric curves also revealed that greater portions of the lakes' surface areas occurred at depths of 1.0 m and below. Lakes Gwakra and Geriyo being shallower had 90.1 and 91.9% of their surface

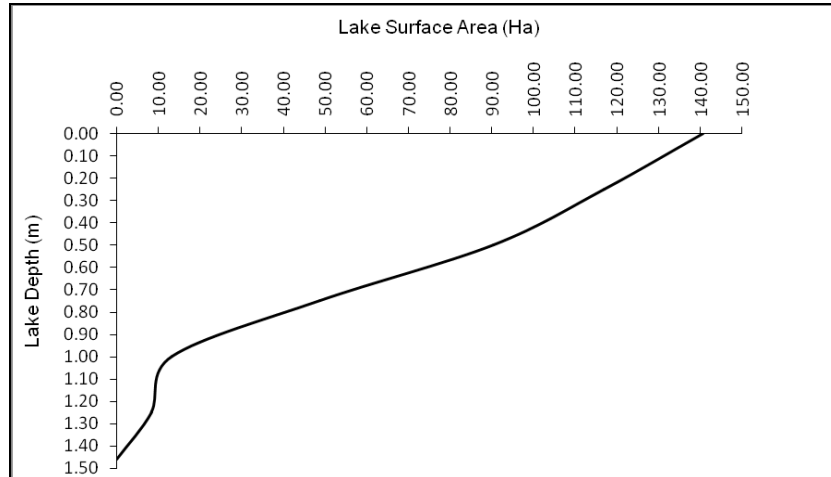


Figure 15. Hypsographic curve of Lake Gwakra.

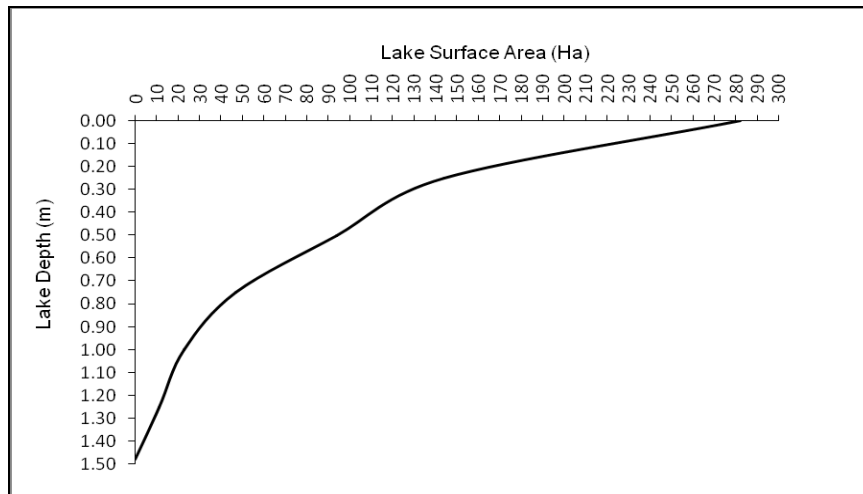


Figure 16. Hypsographic curve of Lake Geriyo.

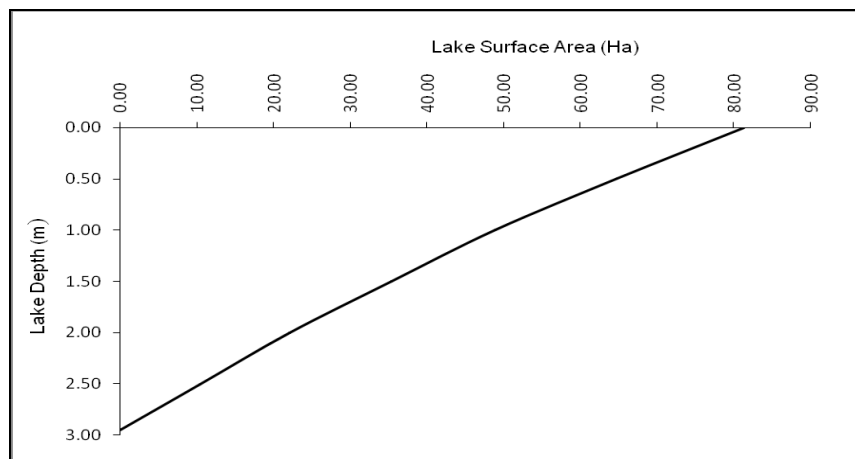


Figure 17. Hypsographic curve of Lake Pariya Ribadu.

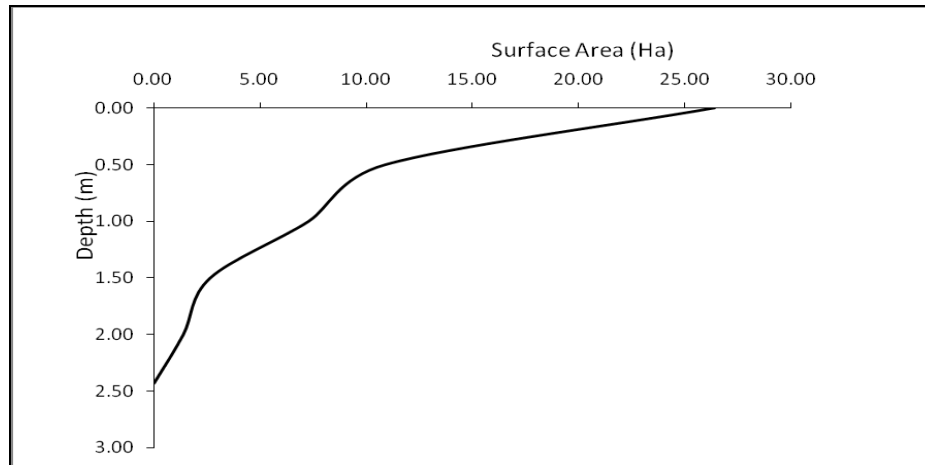


Figure 18. Hypsographic curve of Lake Pariya.

areas occurring at depths of 1.0 m and below, while Lakes Pariya-Ribadu and Pariya being a little deeper had 60.1 and 72.4% respectively. Besides, the hypsographic curves of the lakes presented easy means of estimating their surface areas any depth. For instance, estimations from the curves showed that at maximum depths of 1m, Lake Gwakra would have an estimated surface area of about 13 Ha; Geriyo would have 23 Ha; Pariya-Ribadu, 49 Ha; and Pariya, 7ha.

Conclusion

The bathymetric maps prepared present good baseline morphological information of the lakes basins and serve as relevant tools for morphometric assessment of the lakes, while the hypsographic curves serve as vital tools for estimating their surface areas using available depth data.

Even though the lakes were found to be generally shallow and smaller in size compared to world major lakes, they are considered viable enough to support substantial biological productivity in terms of their volume, surface area, Relative Depth and Index of Basin Permanence. Therefore, viable economic agricultural programs such as commercial fish farming, irrigation agriculture and livestock production alongside well designed water management plans for sustainable utility of the lakes are recommended. Periodic hydrographic surveys and bathymetric mapping of the lakes will also be of great relevance in monitoring temporal hydrogeomorphic changes in basin morphologies of the lakes.

Conflict of Interests

The authors have not declared any conflict of interests.

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Full Length Research Paper

Institutional factors and governance arrangements affecting crop residue utilization in Mt. Elgon Region, Uganda

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Crop production in Mt. Elgon region (Uganda) generates a significant amount of crop residues (CR) that have for a long time been considered as 'trash' or agricultural waste. This neglect is due, in part, to the absence of a clear institutional framework governing utilization of CR. This paper presents a case for understanding of institutions that govern practices of CR utilization. It adopts the Institutional Analysis and Development framework to trace the evolution of institutional mechanisms governing utilization of CR; review the role of current institutional arrangements in influencing CR utilization among farming households; and recommend options that bolster household actions towards the utilization of CR. A synthesis of colonial institutional frameworks including bylaws showed that farmers were encouraged to engage in several soil conservation practices. Strict enforcement of these laws weakened after independence and almost collapsed with successive regimes. There is still a lack of an appropriate institutional framework at local level to influence the utilization of CR in Mt. Elgon region. The paper argues that proper institutional frameworks that penalize improper land use and incentivize better land use practices; build the capacity of farmers through awareness raising programs; and encourage better technologies for CR handling and storage should be strengthened.

Key words: Crop residues, policies, smallholder farmers, Mt. Elgon Uganda.

INTRODUCTION

In rural areas of sub-Saharan Africa (SSA), most people depend on agricultural production for their livelihoods. In

the last three decades, numerous advances have been made in agricultural research and technology generation

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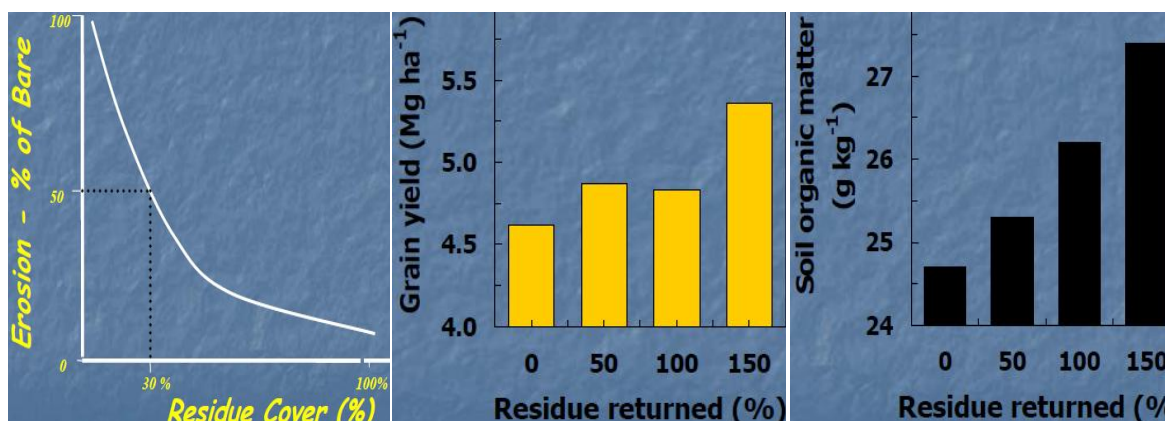


Figure 1. What effects do residues have on soil erosion, grain yields and soil organic matter? Source: Laflen and Colvin, 1981, 607 and Karlen, (n.d), 13.

for increasing agricultural productivity in SSA, and for ensuring sustainable use of scarce natural resources (Njuki, et al., 2008). In Uganda, fertilizer use is still very low and mainly restricted to use on estate crops like sugarcane and tea and on high value crops like flowers. Smallholders have used fertilizers mainly on tobacco, cotton, and vegetables in peri-urban areas and in a few cases on coffee. Total fertilizer use in Uganda peaked in 1971/72 at 27,000 metric tons (MT) before dropping to virtually zero in the 1980s (Roy and Nabhan, 2001). Overall average fertilizer use is still less than 1 kg/ha per farm family per year, compared to 15 kg/ha per farm family per annum reported for other sub-Saharan African countries and its used is mainly confined to large-scale farmers and estates and applied mainly to cash crops (IFDC et al., 2000). An integral part of sustained poverty reduction efforts is improved soil management and sustainable use of natural resources (Nkonya et al. 2004) and the potential role of crop residues should not be underestimated in this regard.

Soil scientists, are quick to point out that these residues currently serve a function on the farm; when left on fields, they help reduce erosion and its associated water-quality impacts, build up the soil's productivity through increased organic matter and nutrients, and sequester carbon that might otherwise be released into the atmosphere as a greenhouse gas. Crop residues are important in the formation of soil organic matter (SOM). In addition, residue buffers soil against the forces of raindrop impact and wind shear and strongly influence radiation balance and energy fluxes and reduce the rate of evaporation from the soil (Wilhelm et al., 2004). Addition of crop residue plays an important role in soil organic carbon sequestration in improving soil structure, soil water-holding capability, and soil erosion prevention. Crop residue is important to soil nutrient cycling and soil

fertility. It was also estimated that residue contained 18 to 62 kg Mg⁻¹ of agronomically important nutrients, depending on the type of residue produced and its nutrient content, which would be equivalent to 83% global fertilizer consumption in 2001 (Lal, 2009 in Hou et al., 2011). Such residues currently replenish nutrients and protect soils (Okalebo et al., 1999), and their removal is unlikely to be sustainable unless accompanied by adoption of soil and water management practices such as no-till production, cover crops, and precision fertilizer management (Marshall and Sugg, 2008). Residues are important crop variables that influence runoff and erosion processes. The Water Erosion Prediction Project (WEPP) Hill slope model predicted that a 10% cover reduced soil loss and runoff by 32 and 28%, respectively. These roles of crop residues are also illustrated in Figure 1. However, adoption of soil management options needs to be accompanied by appropriate institutions and governance frameworks to improve agricultural productivity. While agricultural growth is regarded as a core sector of Uganda's economy in terms of its contribution to GDP and employment (NPA, 2010), clear and well-integrated national policies are required to increase productivity, improve rural livelihoods and facilitate the sustainable use of natural resources (Egulu and Ebanyat, 2000). Policies and institutions can therefore align incentives and create an enabling environment for improved utilization of crop residues and more broadly soil and water conservation.

There has been renewed interest in the use of crop residues in Uganda. Little information, however, is available on the extent to which smallholder farmers in Uganda use crop residues. It is very likely, however, that these resources are under-utilized. Even when they are utilized, farmers may not be able to incorporate them effectively year-round in their agricultural activities. Evidence in

Uganda suggests that the application of crop residues is the most widely practiced soil conservation measure (Yamano et al., 2004). In a study of national level utilization of soil improvement practices, Kraybill et al. (2012) found that the use of crop residue was popular as a soil improvement measure and the percentage of use increased from 27 to 58% from 2000 to 2007. Several studies suggest that crop residues have a potential role to play and are useful in the mitigation of land degradation including soil fertility restoration / maintenance and improvement and erosion control (Brinn et al., 2002; Tenywa et al., 2011); improving crop yields (Sseguya et al., 1999; Takashi, 2008; World Bank, 2005); act as feed resources for animal production (Bareeba and Mugerwa, 1987; Uganda Pasture Network, 1992); and are useful in bio-energy production (MEMD, 2001; Bingham, 2004 and World Bank, 2005). Other studies such as that of Masanza (2003) point to the fact that utilization of crop residues increases attraction and hosts acceptance of weevils. These studies are however, silent on the role that institutional factors play in enhancing the potential contributions of crop residues utilization in agricultural development.

The second part of the paper describes the Institutional Analysis and Development [IAD] framework, while the third part describes Mt. Elgon region; the setting in which the study was situated, respectively. This is followed in the fourth section by an explanation of the data and methods used in the study. Crop residue utilization exists in different forms, is variable across time and space, intersects/links several sectors and domains of decision-making, and conveys a wide range of socio-economic and political meanings. Institutional frameworks and governance arrangement that influenced crop residue utilization in the past are explored in the fifth section. The same section extends the discussion by looking at the current institutions or rules/norms/values at various spatial scales that govern the organization, policies and practices of crop residue utilization. Innovative policy options that would enhance the utilization of crop residues in the region are suggested in section six. Section seven ends with conclusions.

THE INSTITUTIONAL ANALYSIS AND DEVELOPMENT FRAMEWORK

Methodologically, the paper aimed to test how applicable the Institutional Analysis and Development (IAD) framework would be in Mt. Elgon regions. This framework is the collective product of the many and diverse social scientists who have participated in the Workshop in Political Theory and Policy Analysis (Polski and Ostrom, 1999) at the Center for the Study of Institutions, Population and Environmental Change (CIPEC) at the

Indiana University. The application of the IAD framework requires rich information on physical conditions of the region, existing rules and other attributes of the communities. The IAD framework has been developed to enable the analysis of 'institutional settings' – any situations that involve people interacting together in a certain context and following certain rules. The sets of rules relevant to any institutional setting are the institutional arrangements of that setting:

'An institution is simply the set of rules actually used (the working rules or rules-in-use) by a set of individuals to organize repetitive activities that produce outcomes affecting those individuals and potentially affecting others (Ostrom, 1992)'

Institutions may be formally described in the form of a law, policy, or procedure, or they may emerge informally as norms, standard operating practices, or habits (Polski and Ostrom, 1999). They include settled habits, are sets of common habits, routines, established practices, rules or laws that regulate the functional relationships and interactions between individuals and they are the working rules for going concerns. Institutions thus define and limit the set of choices individuals have; they can be created, as a set of incentives or rules for an organization, or they can evolve (informally) as part and parcel of patterns of action or culture. As routines or patterns of behavior in a work culture or social context, institutions explain processes of decision making, conduct and performance. Institutions create dissimilar *incentives* and *restrictions* for intensifying exchange, increasing productivity, inducing private and collective initiatives, developing new rights, decreasing divergence between social groups and regions, responding to ecological and other challenges. A part of the property rights, they are constituted by the *formal* laws, regulations, standards, court decisions etc. In addition, they are important *informal* rules determined by the tradition, culture, religion, ideology, ethical and moral norms etc. The *enforcement* of various rights is done by the state (administration, court, and police) or other mechanisms such as community pressure, trust, reputation, private modes, self-enforcement etc.

To understand the different rights that people have to land, it is conceptually and empirically useful to think beyond *ownership*, or ultimate control of land and the benefits that derive from that land. In practice, full ownership rights are rarely held by one individual or institution. Rather, it is more appropriate to think of *bundles of rights* that may be held by different holders of the rights. There are many ways to identify specific rights, but a useful classification used by Schlager and Ostrom (1992) includes:

1. *Access*: the right to be on the land, such as the right to

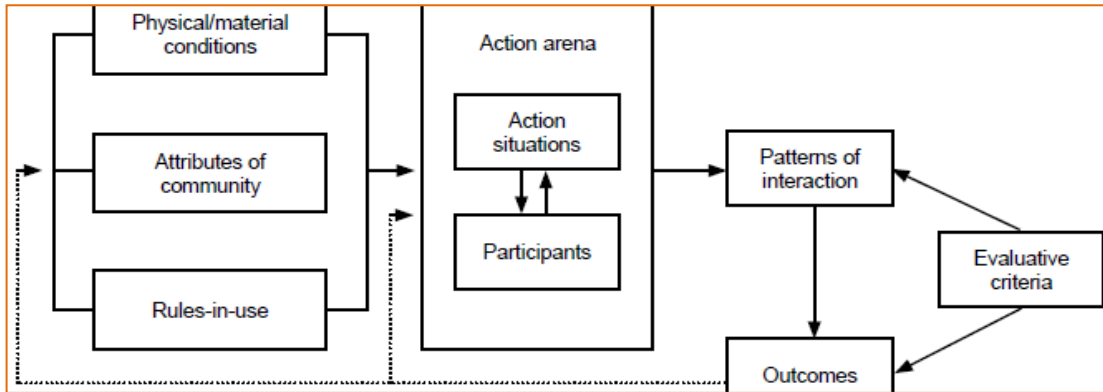


Figure 2. The Institutional Analysis and Development framework. Source: Ostrom 2005, 41.

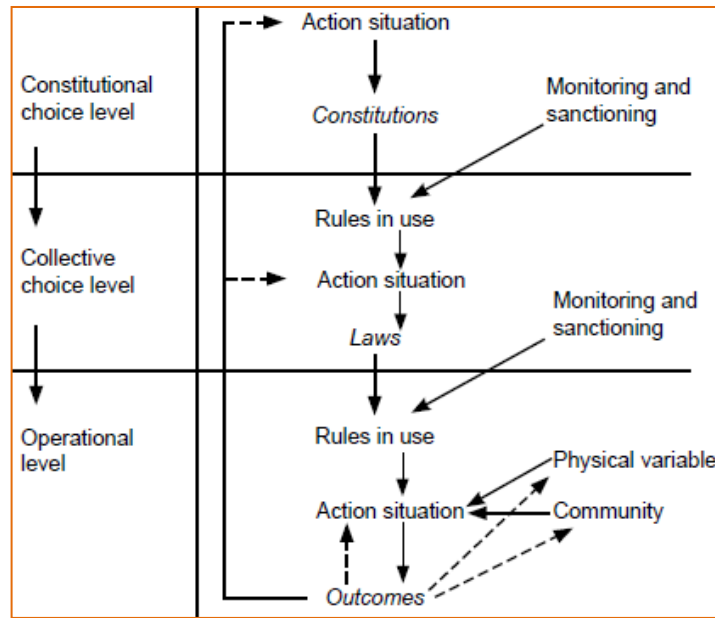


Figure 3. Levels of rules and the linkages between them. Source: adapted from Ostrom et al. 1994:47.

- walk across a field
- 2. *Withdrawal*: the right to take something from the land, such as water, firewood, or produce
- 3. *Management*: the right to change the land in some way, such as to plant crops or trees, clear brush, or make improvements to the land
- 4. *Exclusion*: the right to prevent others from using the land
- 5. *Alienation*: the right to transfer land to others through rental, bequest, or sale

Access and withdrawal are considered used rights, while management, exclusion, and alienation are control or

decision making rights. Each of these bundles of rights can be further broken down and specified in terms of the products, times, and other conditions that apply to the right and whether it can be exercised alone or in conjunction with others. Each application of the IAD framework (Figures 2 and 3) focuses on a specific activity (the *action situation*), the people who take part in this activity (the *participants*) and the *patterns of interactions* between them. The combination of activity and participants is called the *action arena*. Every action arena is influenced by a number of exogenous variables, broadly categorized to be *physical/material conditions*, *attributes of the community* and *rules*. The patterns of interaction

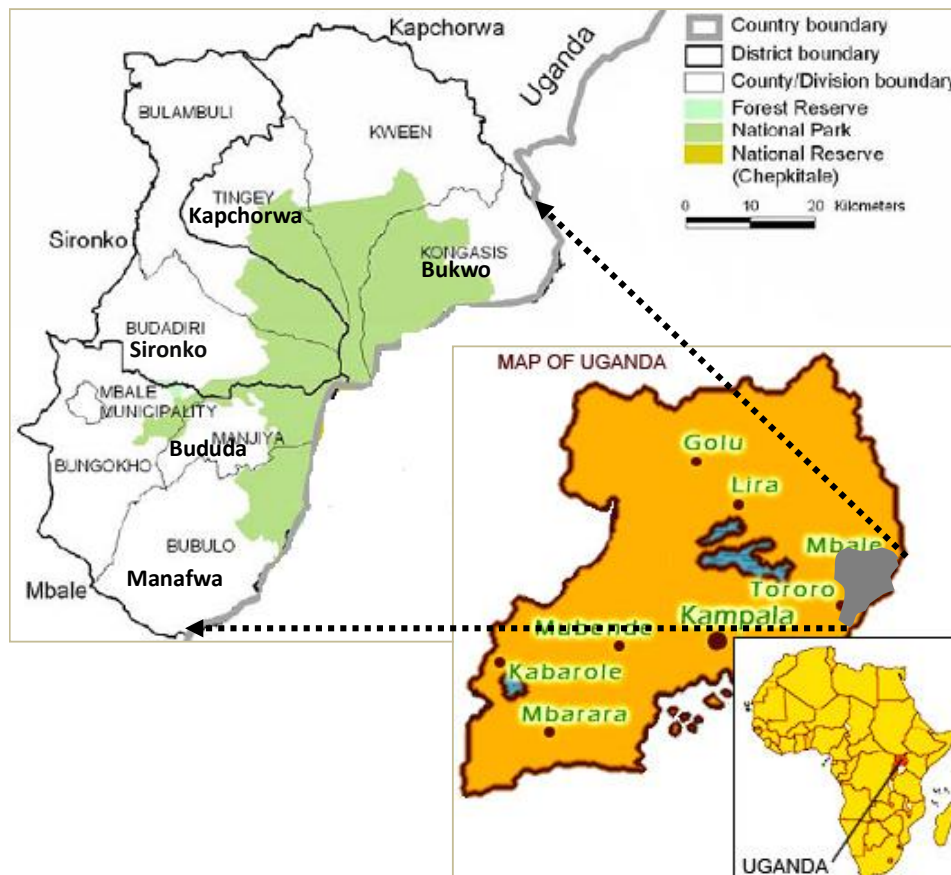


Figure 4. Mt. Elgon region. Source: Elgon map from Soini 2006 (with improvements).

between participants in an action arena result in *outcomes* that may feed back into the original exogenous variables and action arena and thereby restructure the situation. Rules are often nested within, or form the greater context for, sets of rules at a different level of operation. Three vertical levels of rules analysis, proposed by Kiser and Ostrom (1982, in: Schlager and Ostrom, 1992) are seen as cumulatively affecting the actions taken and outcomes obtained in any setting.

1. Operational rules. This is the set of rules that affects day-to-day decisions in action settings. Actions are taken or decisions about future actions are made by individuals operating at this level and are based on the set of institutional arrangements within which they operate.
2. Collective-choice rules. The next tier of rules typically determines what the basic operational rules are and in particular sets the rules about who is eligible to participate at the operational level. Collective-choice level decisions are made by officials in order to determine, enforce, continue or alter actions authorized within institutional arrangements. This level of rules is typically

reviewed or recreated in a 5–10 year time frame.

3. Constitutional-choice rules. This is the top tier, determining frameworks for lower-level rule creation. At this level, rules are set to guide future collective-level decisions that will authorize future operational-level actions. Therefore, constitutional choices are decisions about decision rules.

THE SETTING: MT. ELGON REGION

Mt. Elgon region is found in Eastern Uganda approximately 100 km northeast of Lake Victoria on the Kenya–Uganda border (Figure 4). The district is physically divided between lower and higher altitude regions. The former are only relative lowlands, at altitudes of about 1500 meters, with flat or rolling landscapes. The highlands, with agricultural regions at 2000 to 2500 meters and higher, include areas of steep topography and often very fertile volcanic soils (Goldman and Heldenbrand, 2002). Along the mountain slopes live the Gishu and Sabiny as the dominant tribes. The region

Table 1. Demographic and farming characteristics in Mt. Elgon region.

District	Population [2011]**	Households [2011]**	% distribution of household head by main activity ¹	
			Crop production	Livestock rearing
Mbale	428,800	96,187	79.6	0.7
Bududa	173,700	37,617	91.5	0.0
Manafwa	355,400	81,706	90.3	2.5
Sironko	233,500	52,657	87.1	1.9
Bulambuli	122,300	29,256	n.a	n.a
Kapchorwa	109,300	21,994	89.9	2.6
Kween	98,900	19,431	n.a	n.a
Bukwo	70,500	13,349	98.4	0.0

Source:¹Uganda Bureau of Statistics, 2010.** Rural Communications Development Fund (RCDF), 2011.

comprises the eight administrative districts of Mbale, Bududa, Manafa, Sironko, Bulambuli, Kapchorwa, Bukwo and Kween. Agriculture in Mt. Elgon region is principally rain fed and the quality of soils is deteriorating rapidly due to poor soil management practices (MFED, 2002). Goldman and Heldenbrand (2002) single out the recent declines in fertilizer use in most countries as well as the notable absence of fertilizer use in Uganda for the last quarter century. As a result, even substantial reservoirs of soil nutrients such as found in the more fertile areas of Uganda will be severely depleted with increasingly intensive use. Soil loss in Mt. Elgon region ranges from 45-50 t ha⁻¹ yr⁻¹ on cultivated lands (Bamutaze et al., 2011). Other results by Bamutaze (2011b) indicate that mean annual runoff rates at plot scale vary from 45 m³ ha⁻¹ yr⁻¹ to 332 m³ ha⁻¹ yr⁻¹, averaging 135 m³ ha⁻¹ yr⁻¹ at all sites.

The 2002 census statistics from the Uganda Bureau of Statistics indicate that the population density is variable in Mt. Elgon region, ranging from <50 persons per sq. km in Bukwo district in the north to over to more than 1300 persons km² in the densely populated districts in the south. This high and rapidly increasing density (with a 5.6% yearly growth since 1991) implies land scarcity in the region. As a consequence, farm sizes are small throughout the region, averaging around one hectare and even unstable slopes, often steeper than 80%, are cultivated (Knapen et al., 2005). Dependent on subsistence agriculture and natural resources – such as forests – for survival, these communities feel the negative consequences of unsupported high population growth more acutely than anyone else. In Mt. Elgon, land and resources are indeed finite, and the hereditary fragmentation of land denotes shrinking agricultural yields for individual families.

Mt. Elgon receives between 1500 and 2000 mm of rainfall each year in a relatively weak bimodal pattern. There are a variety of soil types, though most are clayey

with relatively good stability. As a consequence, most of the region is considered to be of high-potential areas and therefore major breadbasket regions for the rest of the country. Individual farms in most of the region grow a diverse set of crops, regardless of how commercially oriented the farmstead or region is. Small holding farming systems in Mt. Elgon region are undergoing a profound transformation from subsistence farming to mixed enterprise, market oriented agriculture. The transition is in some cases abrupt, but in most cases it is subtle as households more fully recognize that their household needs cannot be satisfied by farming in isolation, and they make stepwise adjustments to improve their production and marketing skills (Woomer et al., 1998 in: Sanginga and Woomer, 2009). Other characteristics of the region are presented in Table 1.

General knowledge of the availability and utilization of crop residues in the various agro-ecological zones of Uganda is important for assessing the potential of these resources. The potential of utilizing crop residues to enhance soil fertility and/or control weed growth is of particular interest in Mt. Elgon region with relatively high on-farm prices for external physical inputs (particularly chemical fertilizer and herbicides) and/or a high opportunity cost of capital/cash. In such instances, crop residues conceivably provide an economic and renewable substitute for chemical fertilizer. While crop residues have been used in Uganda in general and Mt. Elgon in particular, since time immemorial, no accurate data have been published on the quantities of crop residues produced in Uganda. In the literature, different Residue Production Ratios (RPR)/Crop Residue Ratios (CRR) values have been reported for the same crop.

Using appropriate conversion factors - crop to residue ratios/residue – production ratios given by Mineral of Natural Resources (1996) and Bingham (2004) we used available crop residue data from Bareeba and Mugerwa (1987) and conservatively estimated the quantities of



Figure 5. Estimates of crop residues (metric tons) generated in Uganda (left) and daily collections of crop residues in Mt. Elgon (right). Picture courtesy of Cavanagh, 2011.

crop residues in tons produced in Uganda and Mt. Elgon for the period 1992 to 2009. Figure 5 shows an increase in the production of crop residues in the country from 1986 to 2009 with a power relationship ($R^2 = 0.54$). Other results disaggregated by crop type are given in Tables 2 and 3 for Uganda and Mt. Elgon region respectively. However, these figures should be treated with caution since most agricultural production goes unreported and does not enter the traditional market chain in Mt. Elgon region. For reasons that are unclear, the same statistics from UBOS do not indicate production statistics for coffee; the major cash crop from the region. The uncertainties associated with the crop-residue ratios or multipliers should also be taken into account when considering these estimates. We argue in this paper that this is a reflection of the past pre-occupation with primary products and lack of interest in by-products and crop residues by the whole agricultural, rural development and research community. In the region, crop residues are used for various purposes and Figures 6 and 7 are illustrative of the multiplicity of functions that crop residues are called upon to perform.

DATA AND METHODS

An assessment was undertaken based on existing published and grey literature. We see our case and analysis as a powerful example of an in-depth study from which we can learn about the implications of crop residue framing in complex policy processes in other contexts. The methodology that was chosen enabled the elicitation of information about rules, sanctions and incentives that

are in use and their outcomes in Mt. Elgon region and allowed the analysis of institutional dynamics in the region. We analyzed our case by means of:

- a) Semi-structured interviews embedded in focus groups (FGs) in Manafwa, Bududa, Mbale, Kween, Bulambuli, Bukwo, Kapchorwa and Sironko District. The semi-structured interviews did not follow a prefixed list of questions but allowed for a conversation based on predetermined crop residue institutional frameworks. The FGs attracted a panel of district officials including district agricultural officers, extension officers, natural resource officers and women leaders;
- b) Reviews of available data and institutional frameworks and procedures and how they influence utilization of crop residues in the region by studying important moments in the decision making process. Statistical data on crop production disaggregated by districts was derived from Uganda Bureau of Statistics Annual Statistical Abstracts and this was reinforced by data from the Ministry of Energy and Mineral Development (MEMD).
- c) We also collated, scrutinized and analyzed grey literature including district council proceedings and national policy documents. These documents included the 1995 Uganda Constitution, the Local Government Act 1997, the Land Act 1998, National Soils Policy and the National Environment (Mountainous and Hilly Areas Management) Regulations, 2000, and the National Environment (Minimum Standards for Management of Soil Quality) Regulations, 2001.
- d) Two regional stakeholder workshops that sought feedback on the current implementation mechanisms of

Table 2. Estimates of crop residues generated in Uganda (1986-2009).

	1986 ¹	1992 ²	1993 ²	1994 ²	1995 ²	1996 ²	1997 ²	2001 ³	2008/09 ⁴
Plantains /bananas		419182 2	441485 6	456450 0	483944 4	491032 8	499571 1	360479 9	2307675
Finger millet	464000	110950	106750 0	106750 0	109025 0	770000	878500	695200	484636
Maize	354000	227978 7	278987 2	294950 0	316811 0	263373 0	256780 0	913002	8195981
Sorghum	312000	525001	536201	545997	558600	417200	411600	478802	526112
Rice	19000	138040	150218	156310	157154	166460	162400	108445	387198
Sweet potatoes	764000	114300 0	117480 0	127740 0	133380 0	928800	113640 0	686900	1091264
Irish potatoes	n.a	214400	256000	979199	321600	254400	288000	155726	123550
Cassava	n.a	159859 2	173272 6	114815 8	122764 8	123924 0	126463 2	667200	1597658
Beans	285000	n.a	n.a	n.a	n.a	n.a	n.a	273001	1300984
Field peas		n.a	n.a	n.a	n.a	n.a	n.a		19744
Cow peas	49000	n.a	n.a	n.a	n.a	n.a	n.a	36382	13268
Pigeon peas		n.a	n.a	n.a	n.a	n.a	n.a		15864
Groundnuts	90000	n.a	n.a	n.a	n.a	n.a	n.a	144000	606826
Soya beans	7000	n.a	n.a	n.a	n.a	n.a	n.a	55299	165270
Sim-sim	22000	n.a	n.a	n.a	n.a	n.a	n.a	n.a	515238
Tobacco	n.a	n.a	n.a	n.a	n.a	n.a	n.a	6851	n.a
Sunflower	n.a	n.a	n.a	n.a	n.a	n.a	n.a	22251	n.a
Wheat	10000	n.a	n.a	n.a	n.a	n.a	n.a	10800	n.a
Coffee	140000	n.a	n.a	n.a	n.a	n.a	n.a	145172	n.a

Source: ¹Ministry of Economic Planning and Development (1988/89). In: Bareeba and Mugerwa (1987, 248); ³Ministry of Energy and Minerals (2001); ⁴Uganda Bureau of Statistics (2011).

crop residue by-laws and regulations were held. A selected group of community members was identified and invited to participate in these workshop to further clarify community arrangements on crop residue utilization in the region and also seek consensus on key crop residue utilization issues that required institutional reform.

The next section describes some of those key policies, practices and informal institutions in detail that affect crop residue utilization in Mt. Elgon region. Some derive from laws and regulations, others from customs, but all are relevant to the success or failure of interventions aimed at changing practices in crop residue utilization.

INSTITUTIONS FOR CROP RESIDUE UTILIZATION IN MT. ELGON REGION

We argue in this paper that the institutional/policy pathway affecting crop residue utilization in Mt. Elgon region is in a state of flux. Crop residue policies are implemented at different scales, ranging from local level

[household] to community [village] to district up to national levels. In this section we provide a brief overview of institutions and explore why there is increasing attention being paid to the institutional issues in water resource management.

COLONIAL POLICY AND CROP RESIDUE UTILIZATION IN MT. ELGON

As early as the 1940s, the Colonial government observed that with increasing population, land in Mt. Elgon was undergoing intensive cultivation and losing its fertility rapidly. This was a period by which policies of agrarian reform, and in particular those related to soil conservation, emerged and evolved (Carswell, 2002). The colonial government became increasingly concerned about land degradation and erosion from agriculture and livestock. The policies that evolved in response to this and the discussion of the directions that policy should follow were broadly similar across East Africa.

Four colonial approaches were adopted. First, the

Table 3. Estimates of crop residues availability (metric tons) in Mt. Elgon region in 2008/09.

		Crop to residue ratio	Bukwo	Kapchorwa	Manafwa	Mbale	Sironko	Bududa	Kween ^β	Mt Elgon Regional Total	National total
Plantains/Bananas	Leaves	0.179	709	4814	10540	17723	5269	10765	0	49820	769225
	Stems	0.179	709	4814	10540	17723	5269	10765	0	49820	769225
	Peels	0.179	709	4814	10540	17723	5269	10765	0	49820	769225
Finger millet	Stalks	1.75	60	0	884	2576	329	105	0	3953	484636
	Cobs	0.27	12324	13474	5222	11514	5035	3040	0	50609	637728
Maize	Husks	0.27	12324	13474	5222	11514	5035	3040	0	50609	637728
	Stover	2	91288	99808	38680	85288	37298	22518	0	374880	4723908
	Bran	0.93	42449	46411	17986	39659	17344	10471	0	174319	2196617
Sorghum	Stover	1.4	0	0	175	598	207	0	0	980	526112
Rice	Husks	0.27	0	0	0	288	7	0	0	295	51499
	Straw	1.76	0	0	0	1876	44	0	0	1920	335699
Sweet potatoes	Vines	0.3	215	47	950	323	255	257	0	2046	545632
	Peels	0.3	215	47	950	323	255	257	0	2046	545632
Irish potatoes	Vines	0.4	189	765	0	135	105	146	0	1341	61775
	Peels	0.4	189	765	0	135	105	146	0	1341	61775
Cassava	Stalks	0.062	6	57	234	1998	573	713	0	3580	179447
	Rhizome	0.49	44	451	1850	15789	4527	5634	0	28294	1462311
Beans	Haulms	0.7	4581	225	848	16546	1490	385	0	24075	650492
	Trash	0.7	4581	225	848	16546	1490	385	0	16445	650492
Field peas	Straws	0.6	0	0	0	0	0	0	0	0	9872
	Pods	0.6	0	0	0	0	0	0	0	0	9872
Cow peas	Straws	0.6	0	0	0	102	44	0	0	146	6634
	Pods	0.6	0	0	0	102	44	0	0	146	6634
Pigeon peas	Straws	0.7	0	0	0	0	0	0	0	0	7932
	Pods	0.7	0	0	0	0	0	0	0	0	7932
Groundnuts	Haulms	2	0	0	934	1388	736	46	0	3104	489376
	Husks	0.48	0	0	224	333	177	11	0	745	117450
Soya beans	Straws	3.5	0	0	7	70	109	11	0	196	82635
	Pods	3.5	0	0	7	70	109	11	0	196	82635
Sim-sim	Stalks	5.1	0	0	122	0	0	0	0	122	515238
Total	Total		170587	190191	106765	260341	91123	79470	0	890847	17395368

Sources: Crop production statistics derived from the Uganda Bureau of Statistics (2010). Crop residue ratios – ^αBingh, (2004) and ^βMinistry of Natural Resources (1996). Note: Kween District data are captured in Kapchorwa district data since the district was recently carved out of Kapchorwa in 2009.

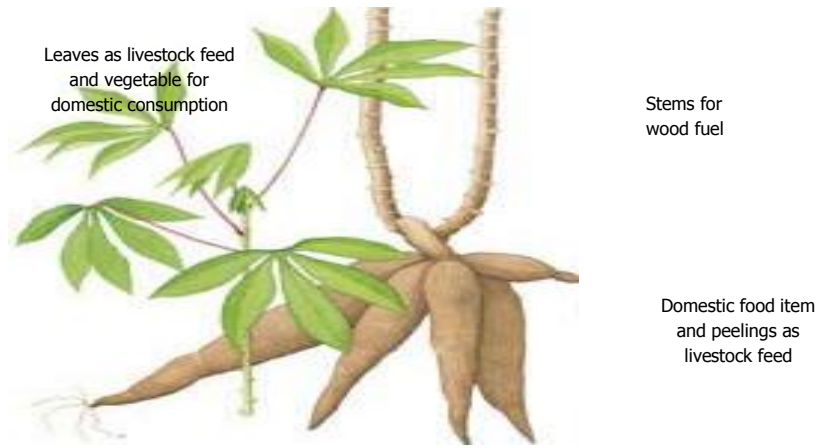


Figure 6. The importance of the cassava crop.

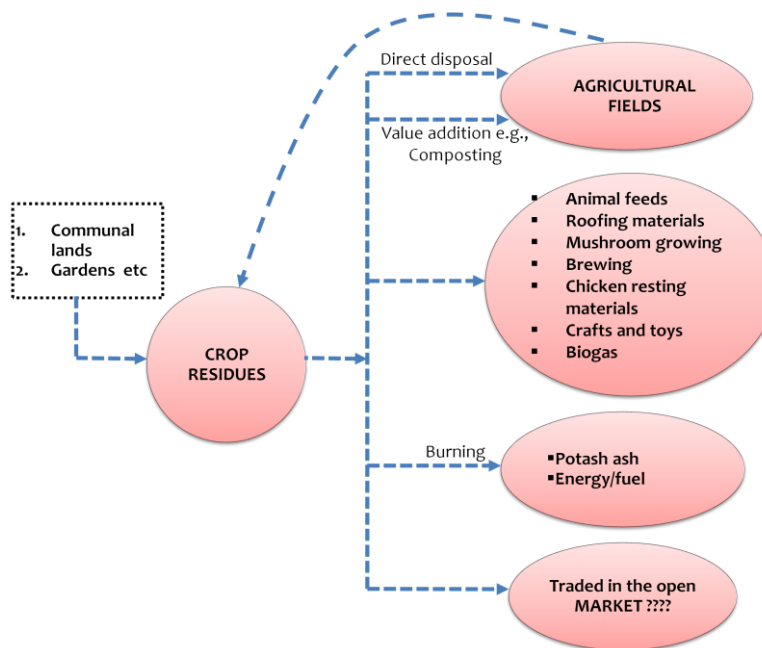


Figure 7. Flow of crop residues in Mt. Elgon region.

colonial period witnessed the development of agricultural institutions and services such as research stations, agricultural colleges, an input supply system, and processing and marketing infrastructures. Secondly, a coercive extension approach was established which in the mid-1950s, was transformed into a new methodology called 'extension through progressive farmers'. This involved targeting selected 'progressive' farmers with advice and support in the form of inputs and credit. Many of the selected farmers were relatively wealthy, had

received some formal education, and were therefore expected to adopt new technologies very quickly. The idea was that this assistance would improve the performance of the progressive farmers. Their neighbors would then follow their example and adopt the new practices, and the country's overall agricultural production and productivity would improve.

Thirdly, the state employed what Carswell (2002) refers to as the stick and carrot in introducing conservation policies: the 'stick' of enforcement in which chiefs and

regulation played a prominent role. Bylaws were formulated in accordance with the District Councils' Ordinance No-1 of 1955. Mt. Elgon region was divided for administrative purposes into counties (*sazas*), sub-counties (*ligombolola*), parishes (*kimiluka*: pl; *kumulukha*: sing) and sub-parishes (*mutongole*). With chiefs appointed at each level, a hierarchy of authority was established, each chief being directly accountable to his superior. All the chiefs (with the exception of the lowest rank) were salaried employees of the Administration. Agricultural rules made under the 'Native Authority Ordinance' were enforced in the lower courts and these rules alone were sufficient to ensure implementation. They were only clarified in 1954 when it was decided that all rules should be codified, consolidated into a pamphlet and issued to chiefs. There were fifteen Agricultural Rules of 1954 and those of relevance to Mt. Elgon included: grazing areas should be set aside where possible, and grass burning should only be done with the permission of a chief (Carswell, 2002).

Boyd et al. (2000) submitted that colonial legislation to promote soil and water conservation distinguished between African land and non-African land. On African land, responsibility for SWC was delegated to local authorities (a system which continues today). However, traditional leaders, chiefs and clan leaders were co-opted by the colonial government to enforce by-laws and collect taxes, which eroded the relationship between these traditional institutions and the people. All local authorities adopted a more or less standard set of by-laws, as follows:

1. potatoes were to be planted on soil ridges across the slope;
2. no annual crops were to be grown within 9ft (2.7m) of any perennial or seasonal watercourse or any
3. maintained road; all paths, cattle tracts, ditches and access roads should be protected against erosion by runoff
4. channels and soak-away stakes; and all house compounds except those in the growing area and compounds around buildings should be covered with mulch where possible.

The 'carrot' involved application of propaganda, competitions and educational courses. The success of these measures was achieved through the direct approach of agricultural department officers and the district team generally to the smallholder farmers concerned working through the medium of the local authority. Colonial authorities thus placed much responsibility on chiefs for ensuring that their 'patch' followed the required measures; if they failed to do so, they were punished accordingly. In addition, chiefs at each level (*lisaza*, *ligombolola*, *kumulukha* etc.) were responsible for

ensuring that all the chiefs at the level below them carried out the work expected of them. By working through this hierarchy, the administration was ensured, then conservation measures were carried out; and it is clear that chiefs were punished without hesitation (Carswell, 2002). Fourthly, a report by Goldman and Heldenbrand (2002) indicates that fertilizer subsidies existed in Uganda including Mt. Elgon region and attempts were also made to encourage people to practice soil conservation through education, propaganda and conservation competitions at sub-county or county level.

These islands of success had some aspects in common. First, there was strict enforcement of policies upon all peasant farmers. Failure to practice them resulted in heavy fines. At that time the agricultural extension service was efficient in advising the farmers on construction and maintenance of soil and water conservation measures. In fact, Boyd et al. (2000) argue that farmers identified strict customs and regulations and their uncompromising enforcement as the most important factor in promoting SWC. Villagers reported that the replacement of customs by by-laws in the colonial period had made little difference. The major difference was in the level of enforcement of the present system. Secondly, there was a high degree of local involvement but Tukahirwa (1988) reports that there was maintenance and enlargement of a well-informed extension service for imparting to the farming community up-to-date information on all aspects of farming. Government also engaged in the conduct of research, field experimentation, and investigation, designed to improve yields and quality of both crops and livestock, and to determine the best methods of land and pasture utilization.

After independence in 1962, most of the basic aspects of colonial policies and laws relating to natural resources and agriculture remained intact and continued to be implemented until 1966. Strict enforcement of laws governing soil management started weakening after independence and almost collapsed with successive regimes and these laws were later abandoned. Opposition to enforced conservation was part of the campaigning platform of the Independence movement, so government policies immediately after Independence did little to promote soil and water conservation. The jubilation of independence was accompanied by a fallacious idea that all of the colonial methods of rule should be discarded. Hence, even in land management, all forms of enforcement of control measures were abandoned (Tukahirwa, 1988). Boy et al. (2000) report that most colonial policies relating to SWC were regarded as oppressive and discriminatory, and so were discarded at Independence in 1962. Lack of leadership by local authorities after Independence, especially in the 1970s, led to serious setbacks in soil and water conservation. People experienced inadequate agricultural extension

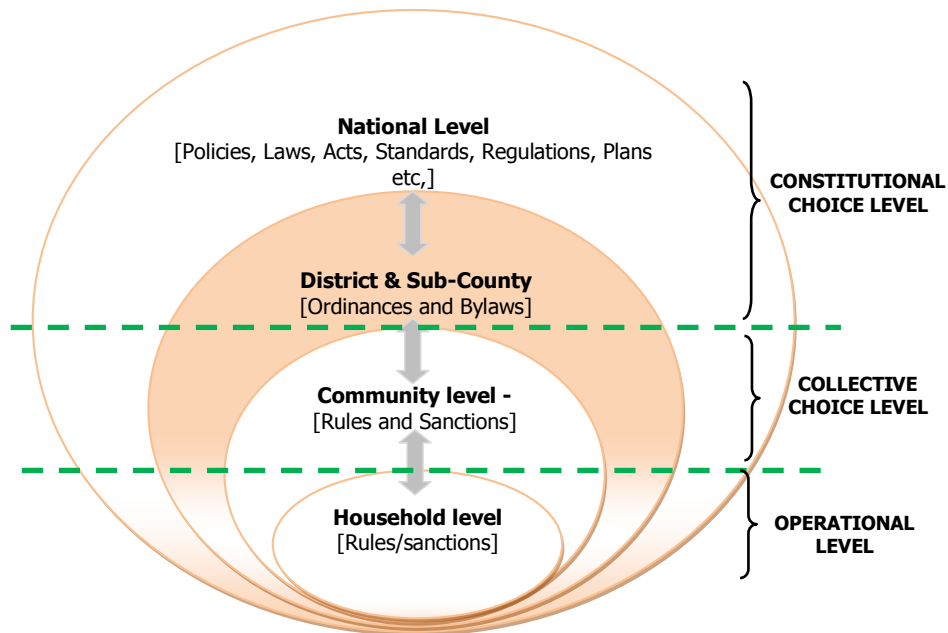


Figure 8. Key spheres and spaces in which institutions operate.

services and even as recent as the 2008/09 Census of Agriculture. UBOS (2010b) reported that the percentage of households visited by extension workers during the past 12 months was miserable 5.7, 8.7, 14.3, 31.5, 6.4 and 6.3% for Kapchorwa, Mbale, Sironko, Bududa, Bukwo and Manafwa districts respectively.

CURRENT INSTITUTIONAL FRAMEWORKS GOVERNING THE UTILIZATION OF CROP RESIDUES

We argue that modern day institutional frameworks and governance processes affecting crop residue use in Mt. Elgon region are multi-level in nature and at different spatial scales including: (a) Household level decision making; (b) Community (village) and Informal Leader Level Forums; (c) Sub County and District Level regimes in crop residue utilization; and (d) National level guidelines for crop residue utilization. These spatial scales can be illustrated in Figure 8.

Household level decision making and crop residue utilization

Unlike other regions in the world, where field crops are produced commercially and generate large concentrations of residues, much of Mt. Elgon region production and use is done by households for self-consumption.

These resources are already used as animal feed, for on-farm applications, and as construction material. Moreover, crop residues are a significant component of the solid biomass fuels used for cooking. Rights to control, use and ownership of customary land are derived from being a member of a given community and are retained by fulfilling certain obligations in the community. In Mt. Elgon region, male elders are the custodians of customary land in most communities and determine distribution of the land. However the family rather than the community has more control in the land utilization, and individuals in the family are allocated land.

Household usually possess primary use rights and there is voluntary land stewardship and a culturally accepted 'land ethic' by household members in general, and farmers in particular, that blends local agricultural production with the utilization of crop residues. Mulching is widely practiced in the banana growing districts including Mbale, Manafwa and Bududa while maize stocks in Bulambuli, Sironko, Kapchorwa and Kween districts are left in the ground after harvest and not removed to allow for the next crop to use available mineral from the decomposing matter. This method has the result that the soil is never left bare, and thus is never exposed to rain and associated sheet and splash erosion. When weeding is undertaken, the weeds and other crop residues are left in the fields to decompose and are incorporated into the soil later to enhance the nutrient cycling system and thus soil fertility. Some residues are

burnt on the fields to prevent disease transmission from one season's crop to the next. However, where the planting of a crop closely follows the harvesting of another, burning of stalks and other residues may be carried out for quick clearance.

In Uganda the guiding principle is as follows: "Any decision taken in respect of land held under customary tenure whether in respect of land held individually or communally should be in accordance with the custom, traditions and practices of the individual or group concerned; except that a decision which denies females or children access to ownership or use of land shall be null and void". Mt Elgon society is a patriarchal society in which males have the privilege of dominance over females. Existing rules and sanctions at household level reinforce and perpetuate male domination and the outcomes of these sanctions manifest themselves in form of:

1. Women being visibly active in the production and use of crop residues. Women informants confirmed that the management of crop residues creates additional demands on women's time, in terms of their collection, use and disposal. It was laborious, too tiresome and needed a lot of work.
2. Male children responsible for searching for, extracting and collecting crop residues and feeding animals especially for farmsteads practicing crop-livestock rearing.

Community level decision making and informal leader-level forums

Crop residues have for a long time been regarded as un-owned properties/assets, making them particularly vulnerable to involuntary loss to other community members. However, most of these residues are rightfully the property of rural communities and farming households, in accordance with customary norms. This conflict of claim and interest directly affects households in Mt. Elgon region. Community use of crop residues in Mt. Elgon regions recognizes the dominance of customary land tenure systems that exist in the region. Although the rules which a particular local community follows are known as customary law, they are rarely binding beyond that community. Of critical importance to crop residue utilization by customary landholders is how far national law supports their land rights. Harvesting of vegetables, bamboo, building poles, mushrooms and crop residues was done anywhere without regard of land ownership. Elders carried out conflict mediation and resolution and they passed on community rules to young generations. Resource harvest regulations did exist, for example, lighting fires outside compounds and carrying fires

through the forest and other common property resources was forbidden with ties to expectations from ancestors and observance of cultural values.

Today, the Local Council [LC] system recognized by the Local Government Act, 1997 seems to recognize the 'community development' era of the 1960s and 1970s. The LC structure provides a framework for creating village assemblies and bestows executive and judicial powers to local councilors to adjudicate in areas where tensions/conflicts arise. Local authorities do not normally interfere in land use and transfer decisions of households on cultivated land. However, when conflicts arise among community members over the use of resources on land, the local authorities generate mechanisms through which these conflicts are negotiated, mediated or regulated in time and place. Tensions frequently arise when herders send large numbers of their livestock to other farmsteads, thereby destroying and consuming a disproportionate share of crop residues. The greater the value of the residues destroyed or consumed, the greater the tension over norms and ways of working within the community. This is consistent with what Brinn, et al. (2002) observed in Northern Uganda where familial, communal and governance institutions (especially village elders, family and front-line extension workers) were of considerable importance to all farmer categories and tended to reinforce similar management practices such as observation of boundaries, time of planting, crop rotations and discouraging burning.

Indeed, the availability of crop residues for soil and water conservations is limited by their alternative uses as coking fuel, livestock feed and structural or handcraft material/fibre and the labor required to collect and process these materials. In Bulambuli district, open access regimes are dominant and for this category, various codes and legislative edicts prescribe in considerable detail usufruct rights for different users and penalties for infractions. In this regard, crop residues have been considered as common pool resources and informal sharing/access mechanisms have been developed and these are mediated by local governance systems under the direction of the LC system. In Bunambutye Sub County, rice growing in the wetland areas produces flows that are subject to two different property regimes. Rice fields that are cultivated by individual households often revert to communal use after harvest or when they are left in fallow so that crop residues and natural vegetation on these fields can be freely grazed by the entire village herd or collected by those households who need them most. Frequently this sets scenes for conflict in Sironko, where herds of cattle trespassing on rice fields or take advantage of crop residues left over in the field. In general, differing scales of exploitation, overlapping rights, and frequent contestation and negotiation of access rules characterize

the use of crop residues.

Crop Residue Learning (CRL) alliances have been established at the sub county level notably in Bukhalu (Bulambuli district) and Kaato sub county (Manafwa district). These alliances which can be judged as *forums for collaboration* bring together influential local leaders, members of women groups, environmental organizations and Makerere University and others interested in promoting the utilization of crop residues. The main activities in these learning alliances have focused on agricultural research with special attention given to on-farm experiments conducted with selected farmers, and results/ varieties shared with other community members.

Sub country and district level regimes in the crop residues utilization

By the 1980s, the pendulum began to swing the other way as academic specialists, international agencies and other specialists began to promote decentralization as a key governmental reform. These experts offered a variety of arguments for greater decentralization in environmental management noting that lower administrative units may have greater opportunities to test innovations and experiment with new policies and programs without having to justify them for the whole country. In Uganda, the central government has dissolved some powers and greater authority has been transferred to the local governments at district and sub county levels to plan and implement programs. The local governments are now charged with the responsibility of managing natural resources (e.g. controlling soil erosion, bush fire, fishing and managing of forests and wetlands). Does decentralization therefore provide new opportunities for access, allowing greater political space for local demands to be made? Are there new opportunities for access to crop residues in a decentralized framework?

District and local councils are mandated to develop specific by-laws on natural resource management, subject to approval by the National Environmental Management Authority (Boyd et al., 2000). With decentralization district authorities have mandates to influence utilization of crop residues and are required to make decisions that determine crop residue management. The district authorities are well positioned to develop policy and programmatic solutions that best meet the specific geographic, climatic, economic and cultural conditions in Mt. Elgon. They are equally well placed to develop innovative policy solutions that can be scaled up into regional or national programmes, or to provide a laboratory for national pilot programmes at the local level. In addition, the district local governments and their "bureaucrats" should provide a direct contact point for residents on questions of crop residue utilization. In this

sense, they have a greater ability to adjust policies to adapt to changing behavior and are more likely to influence popular residue utilization habits than higher levels of government.

Except for efforts geared at promoting trans-boundary natural resources management, no serious effort has been made by the eight district local governments to institute a regional crop residue framework and elevate the importance of crop residues district level. Revelations made during the focus group discussions indicated that three major activities have been tried out in Mt. Elgon region.

Manafwa District Council has drafted the '*Environment and Production Ordinance*'; with several components including: 1) the role of community members/other stakeholders in environmental management; 2) practices for river bank restoration; 3) agro forestry practices; 4) soil conservation; and 5) penalties for non-compliance in environmental management. However, the passing of the '*Environment and Production Ordinance*' at the district has been delayed by bureaucratic procedures in the district council. While sub counties and districts are required by law to formulate ordinances and by laws, there are no formal incentives to ensure anything happens and as a result nothing really happens. For most district councils in Mt. Elgon region, there is an endless planning process (from village to parish, sub-county and finally to district level) in lots of 'bottom up' plans and this has caused much disillusionment among all concerned stakeholders. It is still not clear how the institutional configuration of the '*Environment and Production Ordinance*' would result in open or closed avenues for the participation of the majority small farm holders in decision making on the utilization of crop residues. There is also ambiguity as to which department at the district should be responsible for promoting the utilization of crop residues. Major questions that arose out of the discussion with district officials included: Was crop residue utilization an environmental issue, a rural development concern, an agricultural development problem or a rural energy supply concern? Was it politically, economically and socially appealing?

In 2008, there were reports of excessive extraction and transfer of cow dung from Sironko District to neighboring areas. Sironko District local government recognized that when properly handled, cow dung manure has the potential to be a valuable commodity due to the nutrient and micro-organism content while maintaining the traditional crop-livestock interactions that have existed in the district for a long time. It instituted adhoc Manure and Cow dung Regulations; a *Code of Good Agricultural Practice for the Reduction of Export of Cow Dung*. The code has regulations concerning: 1) reductions in the excessive extraction and sale of cow dung from Sironko District to neighboring districts; and 2) guidelines

surrounding the proper handling and use of cow dung on small holder farms.

It should be noted that simply assigning authority to local users, without ascertaining the range of uses of a resource, the diversity of interests among users and the capability of existing local institutions to take on additional responsibilities, will only complicate rather than solve the problems associated with the appropriation and management of crop residues. Guidelines to local administrations on certain aspects of land use policy are available, but not strictly adhered to, as by-laws need to respond to local circumstances (Boyd et al., 2000). Decentralization has led to major coordination problems because regional and district offices of line ministries continue to be supervised by their respective ministries. Villagers associate the lack of accountability of local authorities with corruption, reinforced by the primacy of political correctness over technical performance as a criterion for promotion. Corrupt and ineffective government institutions have led to the disappearance of those soil and water conservation practices dependent on the enforcement of by-laws (Boyd et al., 2000).

National level guidelines for crop residue utilization

The last twenty years have been awash with a mix of institutional frameworks aiming at enhancing the management of the environment. The role of central government is focused on strategic planning and priority setting as well as policy making and implementation. Crop residue utilization has, however, added a new dimension to the broader and complex environmental, agricultural and rural development concerns in Uganda in general and Mt. Elgon region in particular. Complexity in environmental and agricultural/rural development derives from the variety of crop residues; the temporal and spatial variation between supply and demand; the many claimants on crop residue uses; and the combination of various consumptive and non-consumptive uses.

There exists a wide range of national policies and institutions in Uganda impact on decisions to invest, use, add value, exchange and mediate competing claims on crop residues. National environmental policies (which include elements dealing directly with erosion and conservation issues); land tenure and planning policy; and forestry, agriculture and livestock policies (including agricultural subsidies) have direct or indirect impacts on crop residue utilization at a household level.

A review of recent legislation and policy initiatives at national level revealed that there is no concerted focus to promote crop residue utilization in current household agricultural practices. Under the 1995 National Constitution, the central government is vested with most of the proprietary and legislative responsibility for the

management of resources. Although the constitution provides a number of objectives and principles that concern the environment, related legislations are very silent on crop residue utilization across the country and most specifically the Mt. Elgon region. One of the general principles in the National Environment Statute, 1995 is the involvement of the Citizens, to encourage the maximum participation by the people of Uganda in the development of policies, plans, and processes for management of the environment. The Local Government Act, 1997, the Land Act, 1998 and other acts, statutes and policies have further provisions on sectoral environmental issues and the decentralization of environmental and natural resources management but they do not clearly address crop residue utilization in the country.

With the passing of the National Environmental Act in 1994 and the subsequent establishment of the National Environment Management Authority [NEMA], the policy chronology has expanded substantially and several environmental reforms have been introduced. This, however, leaves a huge question mark hanging over the long term production and utilization of crop residues. A closer look at the National Development Agenda [2010/11 – 2014/15] which now informs development interventions in the country lacks a specific mention of crop residue utilization. However, the most relevant principles of this policy and strategy that would have important implications for crop residue utilization are: improving farming skills; improving the supply, replication and dissemination of technologies; ensuring access to land and tenure security; resolving problems of drought-prone regions; improving the agricultural marketing systems; promoting rural finance; developing the rural energy sector and rural telecom facilities.

There has been revived interest in soil and water conservation in both the Department of Agriculture and the Department for Environmental Protection. This has led to the establishment of a soil conservation unit within the Agricultural Engineering Section and a proposal to designate an officer specifically charged with soil conservation in each district. Local administrations are supposed to recruit people to work as field assistants on soil and water conservation, trained by the Department of Agriculture and paid by the local administration. Extension on SWC is carried out within the same framework as the agricultural sector as a whole. The extension system has recently been restructured and it is hoped that SWC activities will form a major component of the new structure (Boyd et al., 2000, 12). The utilization of crop residues should take advantage of this but little has been achieved in Mt. Elgon region in this regard.

In contemporary Uganda, the agricultural policies appear to revolve around the key concept of “commercialization”. For instance, in the opening pages of the Ministerial Statement of the Ministry of Agriculture,

Animal Industry and Fisheries of 2004, it is explicitly stated that the mission of the ministry is to “transform subsistence agriculture to commercial production of crops, fisheries and livestock by ensuring that the agricultural sector institutions provide efficient and effective demand-driven services to the farming community”. The strategy to deliver on this mission is the Plan for the Modernization of Agriculture (PMA) with its twin programme, the National Agricultural Advisory Services (NAADS). The Plan for Modernization of Agriculture (PMA), enacted in 2001, is part of a broader strategy of poverty eradication contained within the PEAP. In addition to addressing the falling per capita availability of food the modernization of agriculture in Uganda will contribute to the welfare of the poor by, amongst others, increasing incomes of the poor by raising farm productivity, increasing marketable agricultural production and creating on- and off-farm employment. The PMA is not conceived as a traditional agriculture sector investment programme; rather the PMA is an outcome oriented, multi-sector framework anchored to the government’s decentralized structures. In recognition that Uganda’s resources are being utilized wastefully, the key strategies under the PMA for environmental conservation are (PMA, 2000);

1. Prepare participatory land use plans at national, district, sub county, parish and village level
2. Preparation of district, sub county, parish and village level environmental plans
3. Promotion and adoption of best bet practices for natural resource conservation
4. Linking agricultural advisory services, production and environmental committees at all local government levels
5. On-farm research and demonstration of technologies for adaptation and out/up scaling purposes
6. Local administration to assist in development of viable water management technologies
7. Private sector and local government capacity building to facilitate their capacity to effectively take over the planning, designing, and management of water for production facilities

The draft national soil policy of Uganda encourages participation by all stakeholders in effort to control soil degradation. The policy also provides a framework for action to prevent and/or reduce degradation of soils and related resources and promote sustainable soil management. The policy places high priority on the need for updating soil surveys, mapping and implementation of national land use planning (Boyd et al., 2000). The importance of an educated and trained farming sector is recognized in the National Agricultural Education Strategy (Government of Uganda, 2003). This strategy was presented to cabinet for approval in June 2004 as

the National Agricultural Education Policy and Strategy (NAEPS). During 2005, the Ministry of Education had planned to incorporate the NAES into the Education Sector Strategic Plan, but this had not yet occurred as of mid-2005 (ASPS II 2005). Priority areas under agricultural education include:

1. Development of an education policy and delivery of agricultural education in primary and secondary schools, as well as tertiary institutions and universities.
2. Delivery of agricultural education to farmers, youths, extension workers, trainers and teachers through the Agricultural Development Centres and local groups. Such education is expected to be participatory, and will be implemented via role models such as farmers, teachers and extension agents within each community. Other potential activities include farmer forums, seminars, workshops, competitions, exhibitions, exchange visits or study tours and twinning arrangements between local and overseas institutions. The mass media will also be utilized.

The National Environment (Mountainous and Hilly Areas Management) Regulations (2000) applies for Mt. Elgon because of the nature of the landscape. More specifically, the regulations recognize broad principles for observing the carrying capacity of land and advising every land owner to carry out soil conservation measures. The regulations also recommend that a district environment committee may with respect to hilly and mountain areas restrict and control activities which are inconsistent with good land husbandry practices and make guidelines for the management of areas prone to a number of environmental challenges. The regulations further recommend sub-committees on soil conservation that should advise the district authorities on practical ways of conserving soils in hilly and mountain areas. The regulations also present rules for soil conservation but the closest crop residues are mentioned in Section 16, Subsection 1, Clause (f) thus:

A land owner or occupier of gentle slopes in a hilly or mountainous area shall lay parallel to and halfway between the existing bunds, trash lines consisting of dead vegetation where the land is planted with permanent crops.

The review of institutional frameworks in Uganda shows a comprehensive list of national policies and law but their impact on crop residue utilization is not clear. What has been observed through the review of national policies is that they put much emphasis on the broader issue of environmental management and more specifically soil and water conservation. For most of them, less attention is given to crop residues, for example, the Plan for

Modernization of Agriculture enacted in 2001 sought to improve agricultural input market access through various strategies, including:

- 1) improving the availability and timely distribution of high yielding, quick maturing, pest- and disease-resistant planting and stocking materials;
- 2) encouraging the participation of the private sector in seed multiplication, processing and marketing;
- 3) promoting the use of fertilizers by farmers; and
- 4) developing an effective network of stockists to make vital inputs available and accessible to the farming community (Government of Uganda, 2000). All the aforementioned national sectoral policies were approved in a period of about 20 years but they have not yet had a significant influence on soil and water conservation activities in general and utilization of crop residues in particular at the local level. Most of the policies are on paper only and are not practiced. The problems behind the non-implementation of these policies are many, but the most important is the erroneous approach to policy implementation and organization of planning in the country.

In general, there are deficiencies in national laws/legislation and current national legislation is not specifically targeted at crop residue utilization and associated activities in Mt. Elgon region but we argue in this paper that they should be seen as particularly relevant for crop residue utilization in several respects. For example, they become the foundation for local governments to realign incentives and penalties for crop residue utilization at local level.

OPTIONS TO IMPROVE UTILIZATION OF CROP RESIDUES

Utilization of crop residues is not a simple single component technology that can be easily transferred. Instead, it is a complex basket of interrelated practices that typically requires several adaptations to the entire crop production-livestock system. It typically implies a transition phase before becoming fully socio-economically viable - in terms of farmer learning, investments, local adaptation and fine-tuning and institutional change.

- a. There is a need to characterize the types of crop residues, in terms of protein content, energy content, fiber content and then recommend appropriate uses accordingly.
- b. Crop residue availability and feed availability - Areas of surplus and areas of deficit. There is a need to reconcile crop residue production and alternative utilization rates

outside the agricultural sector. Unless production practices and removal rates are carefully managed, large-scale stover removal could threaten the long-term health and productivity of the Mt. Elgon region's agricultural soils.

c. Regulations and other byelaws/local agricultural rules that penalize improper land management/crop residue burning/theft etc

d. There is a need to introduce training programmes for farmers and farming household on utilization of crop residues. These training programs should take advantage of the farmers' groups/crop residues' coalitions that have, for example, developed in Manafwa and Bulambuli district.

These training programmes should emphasize:

1. School curriculum/ household members on the importance and proper use of crop residues
2. Composting and value addition
3. Farmers competitions on best use of crop residues – use self-help groups
4. Local sharing and access mechanisms --- exchanging them on the market/pricing/ trading them on the market
5. The development and dissemination of mulching for smallholders therefore calls for some innovative approaches. Innovative agricultural extension services are important - Reliance on traditional agricultural extension procedures and structures embedded in the National Agricultural Advisory Services Programme and subsequent farmer to farmer diffusion is important in the dissemination and uptake of crop residues in agricultural production. This calls for the allocation of adequate resources (funds and manpower) and, even more importantly, the strategy that can place much more emphasis on on-farm research and development.

e. The role of academics, scientists and researchers connected to lower ranking bureaucrats is important in this particular endeavor. High level of lobbying by academic institutions and funding agencies is important in elevating the importance of crop residues in agricultural production. More research needs to be carried to determine actual use, removals and returns in small farming systems. Selective harvesting of crop residue plant parts (e.g. upper leaf and stalk portions of cereal stover) could provide a relatively high quality feed while allowing parts of poorer feeding value (e.g. lower stover portions) to be returned for soil management. The economics of such practices in terms of labor, and animal and soil responses to selective crop residue harvesting needs to be assessed before they become viable management strategies.

f. Technologies for storage of crop residues -Since the availability of crop residues is seasonal, these must be

collected and stored for use in the lean periods. Drying of straw in the field may therefore have to be carried out before storage. Of the physical treatments, only chopping and soaking are feasible under village conditions. Chopping of banana stems or maize stover improved the voluntary intake of these roughages. Baling crop residues to reduce their bulk and hence increase the quantity that can be transported could be a way of reducing transport costs. Baling is expensive for individual smallholder farmers, because of the equipment required and the need to bale large quantities to achieve economies of scale. Baling could, however, be carried out on a cooperative basis and this should take of the cooperative movement that is still resilient in the Mt. Elgon region. Reports from UBOS (2010b) indicate that about half of households in Mt. Elgon region are members of a farmers group.

g. A factor that may affect the cost competitiveness of crop residues is their high production costs such as harvesting, processing and transportation costs. At present crop residues cannot be produced efficiently due to the lack of market development and development in production technologies and infrastructures. In addition, crop residues are not densely concentrated in a particular region or area. This means greater distances have to be covered to collect and transport residues and this would increase the cost of residue production tremendously for smaller farm holders. It may be a long way to achieve such institutional frameworks as audits, standards [processes and practices] and certification of crop residues but as crop residues enter the market value chain, it is important that all stakeholders involved start to think about these in the near term.

Conclusion

Utilization of crop residues offers great agro-ecological potential: it typically conserves the soil, improves the soil ecology, stabilizes and enhances crop yield and provides various environmental services. However, whether it is actually a viable component for smallholder conservation farming in developing countries depends on a number of factors, including bio-physical, technological, farm level and institutional factors. The prevalent institutional setting is inadequate and may imply the need for institutional change (e.g. development of markets; definition and enforcement of rights/bylaws). Institutional change is more likely to succeed when it is enforced locally and thereby requires active local leadership and/or community involvement and a long-term perspective.

Conflict of Interests

The authors have not declared any conflict of interest.

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