

Evaluating socio-ecological challenges of pastoralism and indigenous peoples' tenure systems on wetlands management in the Upper Noun Drainage Basin in Cameroon

Introduction

Transhumance is a form of rearing in which the herds oscillate between two distinct zones due to changing seasonal rhythms, (George 1994). In which case, he talks of two types of transhumance: descending transhumance towards the plains for pasture, for herdsmen located on hills and ascending transhumance for those in lowlands around the Alps, moving up to the Alps for pasture. This technique of animal rearing that predominates among traditional animal breeders is a common phenomenon in Asia, Sub Saharan Africa and Cameroon. Transhumance is common in these areas because of the restricted ability to develop and manage ranches thus compelling breeders to depend on the evergreen and fresh vegetation of the wetlands. Wetlands in Cameroon are major reception zones for cattle during the dry season since there exists little or no pasture in the uplands at this time of the year. Over time immemorial, wetlands have remained the safe haven for cattle during unfavourable periods such as dry season in the intertropical regions of the world. Transhumance is the major practice in sub Saharan Africa, especially in the Ndop flood plain wetlands of Cameroon. Our study in the Ndop central sub division, that experiences this traditional practice, focuses on transhumance and related socioeconomic activities within the wetland areas. The study also looks at the Evaluating socio-ecological challenges of pastoralism and indigenous peoples' tenure systems on wetlands management. We also look at the implications of transhumance on wetlands ecosystem and habitat following intensive and unsustainable seasonal pastoralism in a mixed farming area. Cattle move in from the immediate surrounding upland areas and other regions of the western high plateau to the floodplain has far reaching socioeconomic and ecological implications on wetlands ecosystem habitat, animal life, population as well as climate change. In the floodplain, Ndop central receives one of the largest numbers of cattle (9185 cows in 2015) that feeds on the natural fodder such as *Pennisetum purpureum*, *Leersia hexandia*, *Scirpus jacobi* etc. Our study shows that wetlands here are experiencing rapid mutations largely accounted for by transhumance with far reaching environmental, socioeconomic and cultural implications. We also observed from our investigation that some of these observed implications are both positive and negative on the wetland ecosystem. Negatively, there is soil compactness, habit destruction and retardation of vegetal growth, pollution of water, river bank destruction, wetland siltation and acute farmer/grazier conflicts. Positively, transhumance generates and boosts the economic processes and rural dynamics. These include the buying and selling of cattle dung, creation of job opportunities, acquisition of cheap beef and dairy products. Culturally, the indigenes have learnt and are fully involved in cattle rearing which was formally a Fulani ethnic group practice. The latter became sedentary and have also learnt how to devote themselves to agriculture. With these implications, some proposals are made to the various actors concerned.

Wetlands are defined as areas that are marshy, fen, peat land or water whether natural or artificial, permanent or temporal, with water that is static or flowing, fresh, brackish or salty, including areas of marine water, the depth of which at low tides does not exceed six metres (Ramsar Bureau 2000)¹

¹ Ramsar Bureau is the office that represents the convention on wetlands, signed in Ramsar, Iran, in 1971. It is an intergovernmental treaty which provides the framework for National action and International cooperation for the conservation and wise use of wetlands and their resources. There are presently 138 contracting parties to the convention with 1314 wetland sites, totally 111million hectares, designated for inclusion in the Ramsar list of wetlands of International Importance.

.With this definition a Ramsar site is characterized by the following: it should be a representative or unique wetland, it should contain important assemblages of fauna and flora, it should be of significant value for birds, especially migratory birds and it should be of significant value for fish. These wetlands especially the flood plains that are major transhumance zones in Cameroon include the Benue, the Logone flood plains of the Far North and the Ndop Flood Plain. As such, cattle movement during the dry season is highly determined by the existence of these wetlands, which according to their characteristics always provide the required pasture during this period of the year. In the Ndop flood plain, cattle move in from the immediate surrounding upland areas and other areas of the western high plateau. This usually results in various stages of interaction leading to diverse environmental implications on wetlands, animal life, land tenure and the population as well as the transit line of movement between the up hills and the wetlands. Ndop flood plain receives one of the largest numbers of cattle (9185 cows in 2015). The species of fodder which attract animals here include: *pennisetum purpureum*, *leersia hexandia*, *scirpus jacobi* etc.

The poor development of grazing methods in Sub Saharan Africa and Cameroon in particular has made transhumance compulsory since there is no alternative in the dry season. As such, cattle's rearing resulting from transhumance is one of the major land use practices that rely most on wetlands during the dry season, due to the evergreen vegetation and rich fodder. This has led to quantitative and qualitative depreciation in wetlands characteristics. The Ndop flood plain is a unique example in character because it is located at an altitude of 1200m above sea level in the western high plateau of Cameroon. It receives thousands of cattle and other animals like sheep, horses and goats from all over the western highlands of Cameroon and Adamawa plateau.

The primary objective of this study was to evaluate socio-ecological challenges of pastoralism and indigenous peoples' tenure systems on wetlands management in the Upper Noun Drainage Basin in Cameroon. Also, to examine the environmental mutations brought by transhumance to the wetlands areas of Ndop flood plain. Finally, to determine the extent to which transhumance influences the social, cultural and economic processes in Ndop flood plain.

Material and Methods

This work was done through the application of various research methods and techniques that largely composed of data collection and analysis. This involved the careful observation and identification of wetland changes induced by cattle rearing during transhumance and related activities. Data was collected from both secondary sources like Ministry of Agriculture and Rural Development and Ministry of Livestock, and secondary sources; and primary sources that was principally field work. The primary field visits were conducted for firsthand information through direct field observations, administration of questionnaires and granting of interviews to resource persons. Field work was carried out in three phases which were carefully planned to coincide with the two main seasons (rainy season from the 5th of September to the 10th of October 2005) which was before transhumance. The second phase involved observation of the wetlands during the dry season. This trip was from the 11th of December 2005 to the 15th of January 2006 and January 2007. There was observation of the cattle movement from their rest places to the grazing areas and to drinking places. There was equally the observation of how transhumance influences wetlands and how wetlands influence transhumance. The third trip was from the 1st to the 5th of April 2007. This was meant to observe the state of wetlands after transhumance and also to observe the behaviour of grazers at this time. In the second phase questionnaires were also administered. Data analysis was through the use of descriptive statistics.

Results and discussion

The wetlands of Ndop Central were at first farming land but the introduction of transhumance has changed this land use type to mixed farming. Also, the cultivation of maize and groundnut which used to be in late January to early February is no more practiced. This has as well adjusted the agricultural calendar of the area. It should however be noted that all wetlands in Ndop plain are state property. This was following the transformation of the Upper Noun Valley Development Authority in a state corporation (1978) by a Presidential decree to manage swamp rice production. This was followed by the declaration of the flood plain as a mixed farming zone by the MINEPIA (Ministry of Livestock) and MINAGRI (Ministry of Agriculture). This is where transhumance is carried out together with farming during the dry season. As a consequence, transhumance, has been intensified in the area during the dry season. This is because of the increase in farming area following land development. The agricultural population has equally increased (8.9%) resulting in high demand for land. This has resulted to shortages in farmland thereby causing the intensification of cultivation and over cropping. As a mixed farming zone, cattle need to be well cared for in the dry season so that they should not stray into dry season irrigated crop farming areas. It therefore becomes difficult to put the area under year-round crop cultivation as a result of the mixed farming nature. Many problems emerge such as the fear to adopt certain innovations as a result of dry season grazing such as hybrid species of plantains, sugarcane and vegetables. It has been observed that grazing benefit from the land development during the dry season than any other land use. Natural conditions and environmental characteristics have made it in such a way that, there is great discrepancy in pasture endowment between areas of origin and destination of animals in transhumance. It is this discrepancy which effect is much pronounced during the dry season that masterminds the use of the technique of transhumance in animal rearing. This discrepancy is viewed here in terms of the differences in environmental variables that are determinant of the quality, type, availability and diversity of pasture upon which animals depend for survival. These variables include: climate, soils, vegetation, hydrology as well as temporal changes in land use.

Natural discrepancies

The upland areas have two distinct seasons just like the flood plains; rainfall there is often high in most cases. Like Jakiri which is one of the areas of origin of the cattle, rainfall here generally averages about 2041mm annually. The average annual temperature is 17.5°C and the maximum is 21.6°C, while the minimum is 12.4°C recorded in the dry season. This climate is affected by the harmattan from the north. These upland areas are known to have temperate climates which favour cattle rearing. The problem here however lies on the dry unfavourable conditions for pasture growth. During the dry season, there are significant temperature differences between the mornings and the afternoons. The mornings are cold, frosty and hazy, while the afternoons are hot, dry and dusty. This situation is compounded by the desiccating effect of the harmattan which bakes the ground, dries up the streams, inconveniences man, animals and plants, making the period the most uncondusive for cattle rearers. This then pushes the cattle rearers to look for alternative ways for their animals to survive, and transhumance tends to be the most preferable. The flood plain however has its own climatic conditions that favour dry season grazing. Ndop Central Sub Division found within the Ndop flood plain shares similar climatic characteristics with the plain as a whole. The plain has a tropical climate with two distinct seasons : the dry season which lasts for four months begins from mid-November to mid-March and the rainy season which lasts for eight months runs from mid-March to mid-November. Temperatures are high in the dry season with

average daily range of about 29-30°C. Upland soils of Ndop mostly result from granitic and volcanic rocks with extremely coarse grains. These soils are very poor in organic content. The vegetation is usually grassland with herbs spotted here and there. These poor soils of the upland can only sustain fresh vegetation during the rainy season. This is compounded by the topography of the upland, and it is an obstacle for pasture growth during the dry season. The soils are very permeable, making percolation easier and faster. This leaves the soils completely dry with the approach of the dry season. Since these dry soils cannot sustain pasture for the cattle during the dry season, transhumance is the only technique at hand to redress the situation because the wetland soils have unique characteristics of sustaining pasture all year round. The soils in the Ndop flood plain are generally hydromorphic depositional soils, that are rich in mineral organic content and associated colluvial and alluvial soils. The marshy and the swampy nature of soils is due to the waterlogged condition of the soils and this helps to sustain pasture during the dry season.

IMPLICATIONS

Environmental Implications

The environmental implications of transhumance in Ndop flood plain are immense especially on soil, vegetation, water regime and biodiversity. These have resulted in mutations that have influenced the wetland's natural processes through habitat disturbance and persistent loss and degradation of the wetland area. These implications are highly felt in Ndop flood plain because of the pressure of the animals on land with close to 10,000 cattle registered annually during transhumance. About 9185 cattle were registered in Ndop flood plain in 2015. As such, there are inevitable wetland mutations that are either positive or negative.

The wetland soils in the Ndop flood plain are generally hydromorphic depositional soils. Transhumance as a pronounced land use practice during the dry season has direct effects on these soils. During transhumance, cattle movements in the flood plain often follows a daily routine of living their rest places in the morning and follow the same path of grazing. These daily movements often exposes the soils because of the trampling effects with the hooves, thus rendering the soils loose where they are dry, hard where they are partially wet and muddy where there is total wetness. These movements often lead to far reaching implications on the wetland soils that can be positive or negative. Animals trample on soils during their daily movements throughout the transhumance period, thereby making them compact. This often leads to limited air circulation in the soils. When the soils are too compact free circulation of the air is difficult which may result to suffocation of micro organisms living in the soil. This is in line with Dasmann et al 1974 who say micro organisms may find difficulties to survive in compact soils. Living organisms in wet soils are, therefore, at risk during transhumance because a few species may be able to survive within the compact soil. This compacting of the wetland soils affects the agricultural calendar thereby creating serious problems to farmers at the end of transhumance. This is because the farmers find it difficult to cultivate their farms before the rains, because the soils are too hard to till especially the rice fields. There is therefore late planting and late cultivation of rice. When rice is not planted early, there is late harvest and this nurses farmer/grazier conflicts as transhumance often begin when this rice is not yet harvested.

Movements to and from the valleys every year have also paved the transit routes living them bare and well defined to the extent that animals, at times, leave the uplands and follow them by themselves to the flood plain. These transit lines provide avenues for concentrated erosion, which lead to gullies as in the situations on the Sabga and Babungo hills. These gullies have

constituted water channels which carry the eroded soils from the uplands to the flood plain. These eroded soils carried to the flood plain are deposited in river beds resulting in siltation which fills up water channels and rendering them shallow and subsequently leaving wet lands dry. This considerably leads to persistent wetland loss and degradation as these soils are brought down every year. Another direct effect of transhumance on soils is increase fertility through defecation and urination by the animals on the soil. Cattle dung constitutes very good natural manure with little or no side effects on the soil. Also, cattle urine produces uric acid which is a nitrate and contributes to increase fertility of the soil. The pH values in nitrate content were the main determinants of soil fertility. As such, it was found out that soils within transhumance areas had higher nitrate contents than areas outside transhumance zones.

Economic Implications

Transhumance has led to significant economic dynamics in Ndop Central Sub Division and the rural area in several ways. These implications may be direct or indirect. Transhumance is accompanied by herdsmen and at times with their families. They live in their huts and go about their normal life as in the uplands. It is without reservation that they pump in their substantial income on basic necessities as household goods. During this period, there is an increase in the demand for certain basic goods due to the fact that the herdsmen are mostly the Fulani who buy almost every basic item especially foodstuffs. The influx of population to these villages has always led to increase prices of wetland products as fish, wood, foodstuffs like bananas, plantains, vegetables etc. The turnover for, basic necessities in small shops around like soap, sugar, salt etc also increases during this period thereby boosting the economy of the area. Transhumance also boosts the economy through increase soil productivity by cattle dung. This has been significant in the rice field and maize farms where the animals graze daily in the flood plain. Field survey showed that the rice fields on which the animals graze yield far better than areas where they do not. Also, the dry farmlands where the animals stay produce about four tons of maize per hectare as compared to 2.5 tons per hectare in farms where chemical fertilizers are used. The manure in the farms where the animals stay is always more than the farm may need, as such; it is transferred to other farms in order to increase their fertility thereby increasing yields. This transfer is also because too much dung and uric acid from cattle urine instead render that spot acidic especially where they stay permanently. At times, some old women who own the farms in these areas of permanent rest gather the cattle dung and set on fire for fear of acidity of their farms.

Farmer/grazier conflicts

The introduction of transhumance in the Ndop flood plain gave rise to competition for land use practices during the dry season. This is usually between the dry season cultivation and grazing, and equally between traditional hunting expeditions, wood for domestic use and construction of tents as well as extension of grazing land. These multifarious activities generate new forms of land use system dynamics. Land tenure had to change from traditional ownership of land to state ownership which is mandatory to all areas that are wetlands. This was done because of mixed farming during the dry season, maize and vegetable cultivation. Each activity is proposed to give way to the other that is transhumance should only start when all the crops have been harvested. In view of the growing population grazing land is being reallocated to suit the farming demands of the population and vice versa. As such graziers solely depend on the wetlands for their cattle to

survive as well as farmers for their livelihood, especially in insisting on dry season crop cultivation. There is always the need to strive for the best by each component. For instance, graziers like to leave the plain in April when pasture most have regenerated, while farmers like to plant their crops in mid-March so as to harvest earlier and cultivate rice. This has often generated acute farmer/grazier conflicts as numerous open confrontations and attacks are recorded in different villages that make up the sub division. Notice that most cases of crop damages are solved amicably but when there is animal cruelty it is handled otherwise, mostly in the hands of the forces of law and order. This has always generated hatred in the study area because the relationship between the graziers and cattle is much the same like the one between the farmers and their crops. As such the relationship between farmers and graziers as they believe is bad.

Modalities set for Handling Farmer/Grazier Conflicts

Farmer/grazier conflicts started since the introduction of cattle rearing and transhumance in the flood plain. As such MINEPIA set in to handle the issue. Over the years several schemes have been set up to handle farmer/grazier, but there have always been failures. However, there is the most recent and existing scheme created in 1978 by Presidential Decree N°78/263 of 3rd July 1978, which set the modalities for handling farmer/grazier conflicts. The commission constitutes of the Sub Divisional Officer, Sub Divisional Delegate MINAGRI, Sub Divisional Delegate MINEPIA, the Fon of the tribe, Chief of the land, an Ardo to represent the graziers and the farmers' representative. This commission looks into the problems and assesses the damages, in which case some charges are levied on the party that deserves them, depending on the extent of the damages. This commission is charged with organising land use in the rural areas, ensuring the aspect of boundaries by both farmers and graziers in agro-pastoral zones. But in case of crop destruction during transhumance, the commission considers the time of the destruction, whether it falls within the time limit of transhumance or not. Despite the Ministerial Order N° 58/ MINAGRI of August 1981, which states the compensation rate for crop damages by livestock, arbitrary evaluation of crop damages is still made by the commission. This has always left the farmers disappointed. However, farmer/graziers prefer to resolve their matters amicably or through the MINEPIA, MINAGRI or Gendarmerie (especially graziers) than with the farmer/grazier commission which they consider expensive and slow to action.

As a mixed farming zone, dry season grazing is therefore done alongside dry season cropping. Cattle movement in the plain is not well coordinated, organized and controlled. Thus, these animals stray into irrigated vegetable farms and at times into the rice fields as the grazier often fail to respect the date for transhumance. This is when cattle are brought to the plain when crops have not yet been harvested. This leads to problems between farmers and graziers as their animal's graze on and destroy crops especially rice. Farmer/grazer conflicts are obviously the order of the day. Crops are destroyed and there is also animal cruelty since both graziers and farmers depend solely on the limited wetlands. At times, there is blood sheds with a far-reaching influence on the socio-cultural life of the people in this area. Some of these conflicts end in the jailing of some victims. Graziers are advised to respect the transhumance periods set by the MINEPIA and to comply with the roles set by the farmer grazier commission. They should at the same time recognize the fact that there is need for amicable solution to their problems. This should be without any discrimination against any party as they all depend solely on the plain in the dry season. Animal control should thus be well coordinated in movement from their rest houses to the rice fields. They should do everything possible to be in good terms with the farmers so as, to be sure

of the rice waste that the cattle feed on in the fields. In this light, they should limit their movements into the rice field, to rice field roads and ensure entrance into it through a single path. These paths are water channels that irrigate the rice field. With this they will avoid trampling on the raised interfluvies with their hoofs causing siltation of the canals. In the same light movement from one paddock to the other should follow a single path. This entails the employment of at least 3 to 4 shepherds to control the cattle movement. The movement will limit cattle destruction of the canal thus limiting the cost and time of reclamation and degradation. Graziers should agree with the farmers not to burn the waste and clear the fresh vegetation, ratoon and water drainage. The graziers should equally allow the cow dung free to the farmers for soil fertility enrichment so as to compromise for their rice waste.

Transhumance has a close relationship with wetlands and need to be well coordinated in the Sub Saharan Africa ensure biodiversity conservation and to create societal awareness of the importance both ecosystems interdependence. Our study focused on cattle movement from Savanna grasslands and results actually reveal environmental, socio-economic and cultural perturbations with observed persistent wetland loss and degradation. This satisfactorily agrees with the hypotheses “transhumance accounts for mutation in wetlands environment”. The implications of transhumance on the biodiversity have been very significant in Upper Noun Drainage basin due to grazers daily routine of moving from place of rest to grazing areas contribute immensely in degrading the ecosystem. Lack of coordinated grazing pattern of movement and conservation strategies account for the excessive siltation of rivers and streams.

Conclusion

The implications of transhumance on the biodiversity have been very significant in Ndop flood plain. This is accounted for by the fact that graziers in their daily routine of moving from place of rest to grazing areas contribute immensely in degrading the ecosystem. Because of the intensive use of common paths to rivers, this leads to scars and bare land in some areas. This creates mutation in the environment, because of the trampling effect and intensive grazing. The movement of cattle into the plain has greatly reduced the vegetal cover, particularly in the transit routes rendering the soils bare and vulnerable to sheet erosion resulting in great siltation in the plain. This siltation of wetlands is tantamount to wetland loss and degradation, and obviously creates mutations in the environment. The customary ownership of land by the traditional rulers has also been influenced by transhumance. Land ownership changes from these traditional rulers to the state, because all grazing lands are national lands and this explains that the flood plain is a mixed farming zone and all the swamps and marshes are state property. Finally, “transhumance had led to changes in land use pattern. The wetlands of Ndop flood plain were at first farming land but the introduction of transhumance has changed this land use type to mixed farming. Also, the cultivation of maize and groundnut which used to be in late January to early February is no more practiced. This has as well adjusted the agricultural calendar of the area. Some of these observed implications are both positive and negative. Negatively, there is soil compactness, habit destruction and retardation of vegetal growth, pollution of water, river bank destruction, wetland siltation and acute farmer/grazier conflicts. Positively, transhumance generates and boosts the economic processes and rural dynamics. These include the buying and selling of cattle dung, creation of job opportunities, acquisition of cheap beef and dairy products. Culturally, the indigenes have learnt and are fully involved in cattle rearing which was formally a Fulani practice. The latter became sedentary and have also learnt how to devote themselves to agriculture. This

daily movement of the animals to and from the streams does not only strip off the vegetation from the hills but as well excavate the soils through trampling with their hooves, making the soils loose especially as they move on specific tracks. This coupled with the heavy rainfall during the rainy season gives way to erosion. Natural conditions and environmental characteristics have made it in such a way that, there is great discrepancy in pasture endowment between areas of origin and destination of animals in transhumance. The discrepancy effect is much pronounced during the dry season when transhumance the only option to most grazers and has far reaching implications in the different environmental variables that determine the quality, type, availability and diversity of pasture upon which animals depend for survival. These variables include: climate, soils, vegetation, hydrology as well as temporal changes in land use. Findings also show that transhumance has almost contributed to the disappearance of wild animals from the wetlands due to habitat disturbance during grazing. The animals that used to migrate into the wetlands during the dry season from the western highland grass fields rarely visit the wetlands, again in large numbers. The few that still come, do so only in the night due to habitat disturbance during the day, and consequently cause mutation in the wetland environment. Finally, “transhumance had led to changes in land use pattern”, is the last hypothesis for this study.

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