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Constraints to Agricultural Advancement within the Ndop Plain North West Region, Cameroon

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Abstract
Over the years, the government of Cameroon has been very instrumental in her struggle towards ensuring increased agricultural productivity. This has been exemplified through the creation of agricultural parastatals to educate the farmers, the provision of high quality seeds as well as the provision of extension services and subsidies to farmers. In spite of the fact that a lot of effort has been put in North West Region, present trends show that agricultural productivity has been declining in many areas. This paper examines constraints to agricultural advancement within this plain using both primary and secondary sources of data. The results show that there is usually a scramble for resources used without adequate management leading to over exploitation and depleting of rangeland resources. It was also revealed that e low yield in crops are attributed to variations in the period the rains come and their intensity, poor quality seeds, pests and diseases.Hence, there is need to organize mass sensitization campaigns against bush burning and embark on sustainable rangeland management by supporting grazers to carry out improved pasture development
Keywords: Agricultural advancement, rangeland resources, climatic variation, crop yield, improved pasture development

1 - Introduction

Over the years, the government of Cameroon has been very instrumental in her struggle towards ensuring increased agricultural productivity. This has been exemplified through the creation of agricultural parastatals to educate the farmers, the provision of high quality seeds as well as the provision of extension services and subsidies to farmers. In spite of the fact that a lot of effort has been put in North West Region, present trends show that agricultural productivity has been declining in many areas. This can be attributed to the fact that most of the innovations which have been prepared and applied in this area, do not reflect the reality on the ground. The rural communities are not consulted before implementing these projects. Consequently, effective adoption and implementation become impossible. It is also of interest to note that within the agricultural domain, the resources allocated by the government and Non Governmental Organizations (NGOs) never get to the rural environments where they are needed. Such resources like tractors, caterpillars and combined harvesters end up in the hands of the authorities put in place to supercede the activities of the farmers. These farmers are, therefore, left with very crude tools such as hoes, cutlasses to cultivate the land which is very time consuming and tidious.
According to Tanga and Fonchingong (2009), the issue of poverty in the North West Region is remarkable due to the high population density and a rural economy that thrives on subsistence agriculture that yields little income which can barely sustain livelihoods. In addition, farmers still have to struggle with severe losses in their produce given that most of the feeder roads still remain seasonal, requiring adequate repairs and maintenance. Generally speaking, apart from a few kilometers of bitummised roads, the region is dependent on earth roads which are often seasonal (Kometa and Ndenecho, 2009). The seasonality of the road networks, coupled with the difficult terrain, high altitude and steep slopes render available food market centres almost inaccessible from the rural areas. Consequently, rural settlements remain largely dispersed some of which are either isolated, remote or marginal rural communities (kometa and Ndenecho, 2009).

In the humid tropical countries like Cameroon, climate could be naturally variable and unreliable during some parts of the year. The predictability of water supply, although dependent on rainfall, is often accentuated by other environmental factors characteristic of drainage basins (March Banks, 2000). Land use changes can equally facilitate and/or attenuate the imprint of climate on stream flow (Scheeder *et al*., 2002). Hydrological variability assessment is essential in the context of natural climate fluctuation since climate is the major driver of agriculture. More so, many farmers in this plain are adept in flood irrigation which is climate sensitive. Flood plain agriculture (Adams, 2000) embraces a number of distinct practices which include farming on the rising or falling flood. Changing flood regime has the potential to alter these practices and the livelihood of the riparian communities. This seeks therefore to examine agricultural activities within this palain and some of the constraints that have retarded agricltural advancement in this area.

2 - Study Area

This Ndop plain is made of thirteen (13) villages (Babungo, Bamunka, Babessi, Baba 1, Bamali, Bamessing, Bambalang, Baligashu, Bagolan, Bamunkubit, Balikubat, Bafaji and Baba 11). Climatic variability in recent years has greatly affected agriculture and communities where rain-fed and artisanal agriculture contribute

significantly to their livelihoods. Ndop Plain (Fig.1) is a highland intermontane plain within the Bamenda High Lava Plateau. It opens out to the south east through which the River Noun flows. It is located between Latitude 5º40¹ and 6º10¹ North of the Equator and between Longitude 10º15¹ and 10º50¹ East. The relief of this plain varies and, consequently, the orographic conditions have an effect on precipitation. The average altitude is 1200m above sea level and it has a humid tropical climate with the annual rainfall in the range of 1500 to 2000 mm. The wet season lasts from mid – March to mid- November. The rest of the months are dry. The annual average temperature is 21.3°C. Large water deficits are experienced from the months of December to February (Babungo Agriculture Post, 2009).

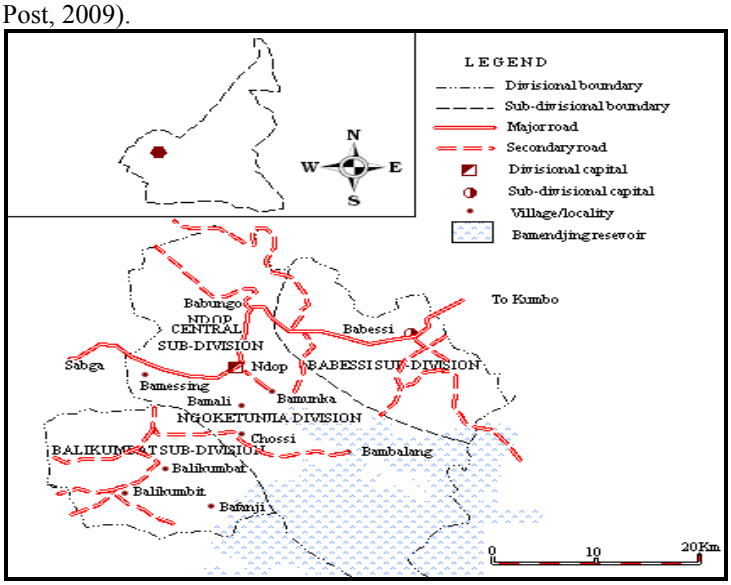

Fig. 1: The location of Ndop Plain

This topographic configuration alongside the high amount of precipitation received over the adjacent uplands contribute significantly in generating seasonal floods on this plain especially during the peak rainy months of July, August and September. During the rainy season, flood waters converge into the Ndop Plain, carrying with it silt and other fertile materials. In its recession, silt which is instrumental for agriculture is deposited. In the dry season, however, much of the surface water dries up, making agricultural activities limited to the areas adjacent to the wetlands. Demographic pressure on land is high resulting in an average farm size of 1.54 hectares usually fragmented into two or three plots at different locations in the village. Shifting cultivation with short fallow periods which used to be typical is gradually phasing out. The pressure on land has resulted in the need to procure external inputs and to modernize the farming system (Lambi 2001). This paper strives to understand the constraints to agricultural advancement and production in this area as well as the contributing factors particularly in the phase of recent unfavorable climatic conditions.

3 - Methods

Farmers were interviewed in order to gather information on the type of support received from the government and how effective or of what benefit they have been to them with regards to increase agricultural productivity. They were also asked of the problem they face in carrying out their agricultural activities. Information was sought from the Cameroon Government through ministries charged with agricultural development, Upper Nun Valley Development Authority (UNVDA), North West Development Authority (MIDENO) and other parastatals involved in this sector. These agencies provided information on the adoption and institution of policies related to agriculture, agricultural extension, innovation and diversification for the sustainable improvement of rural livelihood and regional development. Information on the crops cultivated, fishing cut and animals reared was also collected. Farmers awareness on current and alternative land use options as a means of improving and sustaining food production without compromising the quality of the resources upon which the activities are based was also sought.

Although data on hydro-climatological variables were collected from documented sources, direct field measurements and surveys were also conducted to justify the farmer's perception of the implication of the fluctuating climatic conditions, farm inputs, government subsidies and other factors in the advancement of agriculture in the area. 250 questionnaires were distributed within the 13 villages that make up Ndop Plain. At least 20 questionnaires were distributed in each village. From the 250 questionnaires, 150 were directed to women and 100 to men, since women constitute the highest proportion of the population involved in agriculture. These questionnaires were distributed randomly with no bias to socio-cultural or religious affiliations. The questionnaires helped to bring out the type of crops produced, how farmers alternate crops (crop Cycle) with

fluctuations in climatic conditions and the implication on their yields. This also provided the researchers with the copping mechanisms and strategies which could be put in place in order to improve on agricultural production and improve on food security in the area. Semi-structured interviews were conducted with some officials of UNVDA, the Divisional Delegations for Agriculture in the area, some workers of the Agricultural Extension Department in the area and officials of the local councils charged with promoting and improving agricultural production. The aim of these interviews were to gather data on the type of crops cultivated, the quantity produced per year, the innovative strategies put in place to enhance agricultural production, and the problems faced in this sector.

Rainfall and temperature data were obtained from the Agricultural Posts in Babungo, Bambalang and from the Head Office of the Upper Nun Valley Development Authority (UNVDA). This rainfall data were used to determine variations in rainfall amount and the regularity of the rainfall calendar with respect to the cultivation of the different crop types. These rainfall and temperature data covered a period of about 15 years. This helped to make comparison between total crops output and variations in rainfall. Data on temperature were used to appreciate how variation in this climatic element affects crop ripening. Data on average food produced during the rainy and dry seasons were collected from Ministry of Economy, Planning and Regional Development (MINEPAT) Ngoketunjia (2016), agricultural posts found within this area, UNVDA and MIDENO head office in Bamenda. This data on food production was based on documented records from these aforementioned institutions as well as from field calculations and estimates.

The pair-wise correlation and regression analyses were employed to examine the relationship between climatic variables and agricultural production. These inferential statistical methods were also used in determining the predictability and significance of the climatic influence on observed crop production and agricultural advancement in the area as a whole. In addition, percentages were used to ascertain the people's perception of the role of floods, flood recession and copping strategies.

4 - Agricultural Activities and Trends in Agricultural Production

The North West Region of Cameroon with its naturally endowed volcanic soils has for a long time served the role of an agricultural haven and food basket to the rest of the country. Agriculture is the major economic activity and engages above 70% of the population. The diversified relief consisting of high mountains, plateaux, volcanic hills, deep valleys and flood plains and its manifestation in the fluvio-pedogenetic processes goes a long way to account for the indigenous strategies which have been put in place to resist climatic variability and the harsh environmental realities in order to sustain food production. Paradoxically, these indigenous adaptations, coupled with the Cameroon Government's effort to diversify the agricultural sector and the fertile volcanic soils have still not considerably averted the problems of food shortage, economic hardship and poverty for the majority of the population of the North West Region.

The high population density (given the fast growth rate of the population) is a major factor in the degradation of the environment. The increasing pressure on the land, climatic variability and change is indicated by further fragmentation of land, due to the tenure of inheritance, reduction of the fallow periods, the implementation of more intensive methods of crop cultivation, land conflicts and the cultivation of marginal areas (steep slopes, river valleys and dense areas of primitive forest vegetation). The high population growth rate for the region is best indicated in the municipalities of Nkambe (11.9%), Bali (11.1%), Fundong (11.1%) and Ndop (10.1%) (Ndencho, 2006). It is a high population density region with more than 1700,000 million inhabitants of whom 64% are actually settled on 45% of the 17000 km² of the total land surface with some areas having population densities of more than 200 persons per km² particularly Mezam Division (Lambi, 2001).

The increasing pressure on fuelwood, the main source of energy used by over 90% of the people and the growing problem of landlessness are the drivers of enhanced deforestation and accelerated erosion in the highlands where the soil profiles on the steep slopes are thin, gravelly and stony. These steep slopes in the highlands are the source of yearly supplies of fertile volcanic and alluvial deposits into the flood plains and wetlands (which are widely used for the cultivation of rice and vegetable). The highlands which are underlain by basalts (Lambi, 2001) favour the cultivation of temperate crops like potatoes, vegetables, carrots and cabbages (Lambi, 2001). Other regular crops include maize, beans, plantains and coffee. Given the little or no application of fertilizers, most farmers practise the 'ankara' system (which involves burning of cleared grass covered with soil) as an alternative provision of manure to improve soil fertility. The 'ankara' however, is now widely thought to be a potentially destructive practice as more than 40% of nitrogen in the soil is lost (Kanmegne,1996 sited in Lambi, 2001). Furthermore, the slash-and-burn system results in soil exhaustion in as little as a year, and at most within a few years (Dury, 1981).

Some farmers on the highlands practise mixed farming, whereby crops are cultivated and animals are reared on the same farm. This is because most of the highlands also favour cattle rearing. Consequently, the cattle dung serves as manure to fertilize the soil and boost food production. The fact that the highlands also serve as fovourable lands for grazing is good reason for the farmer-grazer conflicts which are commonplace in the North

West Region. These conflicts directly result from seasonal transhumance of the herds down to the valleys and flood plains, as crops are destroyed and the soil is compacted. These movements between the highlands and the valleys and flood plains are an immediate response to the dry-wet seasonal alterations and variations.

This plain is characterized by clay-loam and sandy-loam soils which are good for agricultural activities. Farming here is extensive and dominated by crop, livestock and aquaculture activities. The use of improved seed variety is common despite their inadequate availability. The intensification of the use of improved seeds will definitely increase production, reduce diseases and increase the income of farmers. Chemical fertilizers and pesticides used on food crops are low while their low availability and high prices remain a problem. The production of market oriented gardening crops like tomato, cabbages, is common in the high land zones involving an intensive use of inputs and labour. Labour is essentially provided by family members, farming groups and hired labour for some farming activities like rice and tomatoes cultivation. Concerning animal production, there are the extensive and semi-intensive types, which involve large ruminants, small ruminants, pigs, poultry and cattle. Conflicts usually occur during transhumance animals stray into crop farms. The concept of crops livestock integration is still to be improved upon. Fishing activities are more developed where rivers low along the plain, but the fishing techniques are still traditional. The agricultural pressure is more pronounced on lowlands and urban area than on the highlands due to easier cultivation possibilities and high population density respectively.

Hence, the economy of this area is greatly dependent on agriculture. This area like all of the North West Region even depend more on agriculture as there are few alternative sources of employment and income generating activities for the population. Based on these facts, hardly will one find any family that is not involve in one form of agriculture or another. Consequently, the agricultural population of this plain comprises essentially of farmers, graziers and fishermen (Table 2), distributed according to the agro-ecological potentials of the various parts of the plain. From a total population of 217348 inhabitants projected after the 3rd national census of Cameroon in 2005, the Ndop Plain (Ngoketunjia Division) has an agricultural population as shown on the table below. It is important to note that most of the people engaged in farming are also to some extent involved in fishing and grazing.

Table 2: Estimated Agricultural population within the Ndop plain

Study Area	Farming population	Grazing population	Fishing population	Total
Ndop Plain	209457	987	191	210635

Source: Divisional Delegation of Agriculture for Ngoketunjia, 2016

Arable land constitutes land that can be suitable for agricultural production. Table 3 below indicates the estimated arable land of this plain and the portion that is effectively being cultivated. Although this plain is heavily depended on agriculture, less than half of the arable land is effectively being cultivated. Limited rural labour force due to high exodus to urban centres, high traditional agricultural practices are some of the reasons that account for the low exploitation of the available arable land. There is still much potential for agricultural expansion in this area.

Table 3: Arable land and the estimated portion that is effectively cultivated

Study Area	Arable land	Arable land effectively being cultivated
Ndop Plain	119500	29875

Source: Divisional Delegation of Agriculture for Ngoketunjia, 2016

Different agricultural practices are carried out within this plain. These agricultural practices and the estimated percentages of farmers that carry out such practices include; crop association (84 %), crop rotation (24 %), irrigation (18.7 %), mechanised farming (8 %), mixed farming (35 %), shifting cultivation (6.7 %) and slash and burn (26 %). Generally, crop association is the most common farming practice while shifting cultivation is the lowest due to the high population density in this area (120,8 habitants/Km²). Also a large proportion of the population (26%) still practise slash and burn (Ankara) which is one of the types of agricultural practices that reduce soil fertility. Mechanisation through the use of animal traction or mechinery is negligible throughout the plain. This is because the technological knowhow and equipment are limited. Animal traction is practised by a handful of farmers. Hence, agricultural practices in this area are still very traditional. Intervention is required in the areas of soil conservation and soil fertility improvement, irrigation farming and mechanised farming.

5 - Constraints to Agricultural Intensification

The land use map of this plain shows that farmland occupies about half of the arable land. Grazing land occupy the second largest portion. Cattle grazing is mostly done on the less fertile hills. However, during the dry season, cattle grazers move all or part of the their cattle down into the wetland for green pasture. These movements often result to conflict with farmers. In order to optimize land use and reduce conflict over resources, a shift from traditional farming/grazing to a more sustainable approach is imperative. National land in this area is owned and controlled by the traditional authority through customary tenure. Field evidence shows that land in this area is

mostly acquired through inheritance while some families and individuals buy land. The landlords sometimes lease portions of their land to individuals or groups for agricultural activities. In most grazing communities in this area, there is usually a scramble for resources used without adequate management leading to over exploitation and depleting of rangeland resources. Analysis of the farmers interviewed shows that men mostly control lands and the women have limited access to own land. However, women who have money can buy land. These problems of acquiring land by women greatly reduce the agricultural productivity since the women are those mostly involved in the agricultural sector.

6 - Agricultural Strategies and Policies

The government of Cameroon through the Ministry of Agriculture has put in place measures to liberalize the marketing of fertilizers and pesticides, and institutions of appropriate credit lines to facilitate the purchase of fertilisers and pesticides. However, the privatisation of the production and marketing of plant material by setting up a seed multiplication and distribution system based on private initiatives at all levels did not provide adequate training to farmers and distributors. Consequently, more than 60% of the local farmers indicated that they are still using unimproved seed materials. Also, fertilizers and pesticides are scarcely accessible and the prices are high. the credit facilities are unable to meet farmers' needs due to their untimely disbursements.

Farmers here still face the problem of unimproved seed material, low technical know-how in natural crop protection techniques and the real applicability of research results in the field despite the presence of agronomomic research institutions in the region and the presence of national agricultural extension programme. This programme works with a limited number of farmers and research results are scarcely documented both at the level of the farmers and at the centres. Less than 5% of the agriculture carried out in the Ndop plain and the North West Region as a whole is mechanised eventhough this area is suitable for more intensive modernized agriculture. Modernizing the production machinery will not only increase crop production in the area and the region as a whole but will improve food self sufficiency. Equally, the law on cooperative societies and common initiative groups of 14/08/1992 together with its decree of implementation and the law on the micro finance sub-sector have laid the ground work for a sound organisation of farmers in the North West Region in general and Ndop plain in particular. If these laws are implemented, they will greatly improve the agricultural landscape of the area.

In the North West Region as a whole, the investment fund for agricultural and communal micro projects Agricultural Investment and Management Credit Fund (FIMAC) and MIDENO use to produce micro-credit loan schemes to farmers to boost their access to farm inputs and increase production. However, since 2005, MIDENO for example has not disbursed any funds to farmers. In order to enhance food security, MIDENO should continue its loan scheme so as to reduce pressure on farmers who cannot afford collaterals demanded by credit unions. Furthermore, it is important for them to set up a functional early warning and market information system that collect and document information regularly to enable the population to know its food situation.

Generally, to maintain the growth rate of the country's Gross Domestic Product (GDP), the agricultural sector has to account for about half of this GDP. Hence in the North West Region as a whole, specific regional projects like Grassfield Participatory Decentralised Rural Development Project (GP-DERUDEP) and other national programmes on agricultural research and extension have been set up to enhance agricultural and rural development. Over 70% of the people in the Ndop plain depend on agriculture for their livelihood. The ecological conditions of the area favour the cultivation of a variety of crops.. Farming in the plain is mostly subsistence involving traditional practices, the use of rudimentary tools and cultivation of small farm sizes. As a result, the production per hectare is low. Since 2006, there has been a general improvement in agricultural production in this area though with some fluctuations within the years. The total area cultivated has also increased by more than 25%. However, the quantity of maize and beans has been increasing but the yield per unit area cultivated are still low. From field survey, 85% of the farmers indicated that the low yield in these crops are attributed to variations in the period the rains come and their intensity, poor quality seeds, pests and diseases. This quantity in production is reflected in the total production trend in some crops cultivated in the North West Region as a whole in 2015 (Table 1).

Table 1: Estimated quantity of some major crops cultivated in 2015

CROP	PRODUCTION (IN TONS) IN 2012
Maize	48732.5
Beans	48379.7
Irish Potato	69187.5
Yams	13105
Rice	3076.9
Plantains	25096.4
Cassava	128689.7
Tomatoes	3946.9
Groundnut	7897.7
Cocoyam	131748.7
Palm oil	15594.1
Sweet potatoes	5638
Total	503098.1

Source: Annual reports of Divisional delegated of Agriculture and Rural Development (2012), section for Agricultural statistics.

This low production per unit is attributed to the fact that farmers do not have access and have not adopted improved farming techniques and often use local planting materials. Hence, improving soil fertility, provision of improved seed materials and training on modern farming techniques cannot be over emphasized. Despite the high demands for tomatoes, its production has been declining since 2010. Other problems that have also hindered the production of tomatoes for example are linked to hail stones at the beginning of the wet season around the months of March, April and May. However, despite this growing importance for tomatoes, the high perishability in the midst of poor storage facilities and continuous care required by this crop as well as highly fluctuating market remain discouraging factors to many farmers. Although it is an activity that contributes significantly in alleviating poverty in this region, a number of problems contribute to affect its production. In the past when the Tomato Scan Company in Foumbot used to process tomatoes, its production was high given that a much more stable and ready market existed. However, its closure resulted in the decline of tomato production given that farmers were no longer sure of a ready market. This resulted in the switch of a number of farmers to other market gardening crops. There is therefore the need for the development and encouragement of agro-industries to process and market these products to minimize decomposition and to boost production and productivity.

Common pests and diseases common in the Ndop plain include mosaic, tuber rot (cassava); nematode infection (cocoyam); stem borers, maize streak virus (maize); mildew, wit, blight (tomatoes and vegetables); black spot on leaves and tuber, yam beetle, tuber rot (yam). Over 90% of farmers interviewed indicated that crop pests and diseases are still a major set back in agricultural production in the Ndop plain. From field evidence, only a small fraction of farmers spray their crops with fungicides, insecticide and pesticide. A majority (over 65%) of these farmers practise off rooting of infested plants. The use of wood ash on vegetables, tubers is commonly practised. The poor farm to market roads further aggravate the problem of farmers here as they are forced to sell cheap to intermediaries who manage to reach such markets. This plays negatively on farmers and hence hinders production. Given the above issues, it is necessary for the government of Cameroon through its specialized organs and stakeholders charged with agricultural modification in this region to improve major farm to market roads in the area, improve farmer's knowledge and skills in transformation and storage of crops especially perishables. Fertilizers, improved seeds and pesticides should be made affordable and available to farmers and farmers should be educated on the use of animals and machines for farming. Also, in order to increase agricultural production, agricultural inputs should be subsidized and farmers trained on the use of these inputs.

Post harvest losses are still a major problem to crops in this area and these losses are registered at various stages that is from harvest, processing, transportation, storage to marketing. From the analysis, the greatest amount of losses occur during harvesting and storage as well as during transportation. Such losses can be minimized if processing units are set up, storage facilities established such as cold houses and farmers trained on post harvest management systems. Also, food processing is very important. The unavailability of electricity in most rural areas makes it difficult for processing to be carried out on a large scale. Field survey also reveals that over 65% of farmers here use local barns ("bandas") for the storage of their maize below the eves of the roofs of their houses while more than 5% use drums and jute bags. These storage structures are rudimentary and small. Some storage facilities that were constructed by MIDENO and other organizations have either been abandoned or used for other purposes. These structures were abandoned because they were poorly located and the management was not directly in the hands of the farmers.

Training is an important component in agricultural development. Within these plains, there are Community Education and Action Centre (CEAC) Ndop. and CEAC Balikumbat. These institutions face a lot of problems with the lack of basic facilities. If these institutions are well structured, and the basic facilities provided, these personnel will help improve on agricultural production in this area. However, other research institutions, NGOs and councils are doing a lot to foster agricultural production. Their activities, however, need to be coordinated to improve on agricultural production in this area. Human resource is an important aspect in agriculture. The number of agricultural personnel deployed to each agricultural post that are found within this plain are very small (one per post). This depicts that the need for technical assistance to the farming population is grossly insufficient. The Ministry ofAgriculture needs to employ more personnel and deploy especially in rural areas where their services are needed most.

Animal rearing is a common practice within this plain due to its physical landscape. climate and grasslands with spotted forest patches making it easy for free range grazing of various livestock. In 2009, the grazing land per hectare in the whole of the Ndop plain was 932ha for over 320 grazers with cattle population of 7329 cattle (MINEPIA 2009). In terms of the grazing land, bracken fern occupies approximately 30% of the total grazing land. This plant is not good for cattle. Current trends in the field show that little or no measure are being taken to eliminate this plant which is a major threat to livestock production. Hence, there is need to organize mass sensitization campaigns against bush burning and embark on sustainable rangeland management by supporting grazers to carry out improved pasture development. Heifer project International trains dairy farmers on zero grazing. This type of grazing technique should be encouraged to reduce over grazing and over stocking.

In the dry season, grazers within the highlands move their cattle into the wetlands found within this plain in search for green pasture. This often results in farmer/grazer conflicts, increase in bush fires by grazers, transmission of pests and diseases and high rate of cattle theft. These problems can be solved by improving pasture, developing cattle track in various areas, encouraging "Night paddock system", encouraging sustainable rangeland management. Other small livestock reared in this area include pigs, rabbits, poultry, sheep/goat and Guinea pigs with fluctuating output over the years. These fluctuations may be due to frequent diseases incidence and expensive veterinary services, limited access to improved breeding stock. This situation could be improved by training farmers on small livestock husbandry techniques, improve access to improved breeding stock by farmers and provide support to young veterinarians through credits.

The Ndop plain has the biggest fishing ground (lake Bamendjin which extends to Bambalang) in the North West Region having over 80% of the total fishing population and fish catch in the region. The species caught include Tilapia, clarias and carp. However, there is no documented information with regards to the quantity harvested. Field survey reveals that en estimated 62 tons is harvested annually though with some fluctuations. This fluctuation is attributed to a number of factors particularly given the fact that most of the fishermen here are men who carry out other activities like farming and petite trading. Fishing is done using traditional hang-dug boats , cast nets and hooks. These local fishermen use nets with very tiny holes which trap even very tiny fish that still require enough time to fully mature. This unsustainable fish exploitation by the local fishermen results from the growing human population and the consequent increase in the demand for food in and around the area and even beyond. However, this increased production is attributed to overfishing which is increasingly becoming a cause for concern. If this concern is not addressed, fish production which remains the second major source of livelihood of the people may become obliterated in the long run.

Other problems associated with the fishing activity in the area relate to the seasonal changes in the behavior of the lake waters which is a function of the trapping and release of the waters to satisfy other demands related to hydro-electricity generation and swamp rice cultivation. This trapping and release of water is significantly dependent on the seasonal variability in rainfall conditions. The trapping of the lake waters is usually done in the rainy season characterized by abundant rainfall, while the release is done during the dry season when drastic reductions in rainfall volumes translate into a reduction and sometimes dry-off of some streams. Furthermore, there is the inability of the fishes to migrate freely due to the dam and, siltation of the lake bottoms which buries fish spawning habitats (Kometa & Ndenecho, 2008). Fish caught is smoked before selling. Over 75% of the fish farmers contacted here indicated that they are carrying out the activity at a subsistence level.

7 - Conclusion

The increasing demand for food in the rural and urban areas of Cameroon calls a paradigm shift from the traditional societal use of crude tools for cultivation to an advance methods of cultivation to ensure food security for socio-economic sustenance. Bearing in mind the constraints faced by the agricultural sector there is need to revitalize the techniques used in the cultivation process. Though efforts have been made by the Government and Non Governmental Organizations to boost the agricultural production, some farmers remain adamant to welcome the current changes in the methods of production irrespective of the climate change phenomenon which is greatly affecting the water resources available for crops. This calls for a great deal of sensitization and the need to concentrate on the second generation agriculture within the Ndop Plain in particular and Cameroon at

large.

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Upper Nun Valley Development Authority (UNVDA) 2015 Report

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