THE FACTORS INFLUENCING THE PRODUCTIVITY OF UPLAND RICE IN
THE NORTH WEST REGION OF CAMEROON
CASE STUDY BAMENDA III SUB-DIVISION

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ABSTRACT
Cameroon’s rice demand has been on an increase due to increasing population, urbanization and changing consumer preferences. The resulting effect has been increased importation of rice into the country consequently straining foreign exchange accounts. Insufficiency in the rice supply is related to the low national average yield of 1.5t/ha. New upland rice varieties that are high yielding have been introduced in the country to improve national supply, save wetlands, fight food insecurity and improve incomes of the rural poor.

Scope and purpose
This study was conducted in North West Region of Cameroon in Nkwen Bamenda III Sub-Division. It examined whether farmers were technically efficient in input use to generate the required output levels and the farm specific factors that were affecting their adaptation and productivity.

Methodology
A total of 60 respondents were randomly selected from three rice producing villages using a sampling frame generated by the sub-delegation of agriculture mile four Nkwen. Analysis was accomplished using Microsoft Excel.

Results
Results revealed that production of upland rice involved excessive use of labour. It was also found that Productivity of upland rice producers were below the frontier level. Attainment of primary five education significantly improved efficiency of farmers.

Conclusion and recommendations
For farm level Productivity of upland rice to improve, yield improving and labour saving technologies need to be introduced notably soil enriching aspects like both organic and inorganic fertilizers. For labour saving technologies, use pre or post emergency herbicides and mechanization of the upland rice would be a better move in the right direction. Lastly promoting primary education and specialised extension services that target upland rice will improve efficiency greatly thus increasing productivity.

Keywords: Agribusiness, Rice productivity, upland rice, agricultural extension

INTRODUCTION
Rice according to the oxford advance learner’s dictionary 8th edition is a short narrow white or brown grain grown on wet lands in hot countries as food. This cereal plant (oryza sativa), is mostly grown in countries like Thailand, china, Japan, Malaysia, India, Cameroon. This crop originates genetically from a single domestication in about 8,200 to 13,500 years ago in the Pearl River valley region of china. Archaeological evidence had suggested that rice was domesticated in the Yangtze River valley region of china. From East Asia, rice was spread to southeast and western Asia. From Asia rice spread to Europe and the Americans through European colonization. From Europe rice was introduce to Africa (Egypt) through the Portuguese sailors some 500years ago according to Tackholm, (1949-61, 1:411) to replace the African rice strains.

Rice is one of the principle cereals used by the world’s inhabitants. It is an ancient crop consumed as a staple food by more than half of the world’s population. It is estimated that rice is utilised by over 4.8 billion people in 176 countries and is the most important food crop for over 2.89 billion people in Asia, 40 million in Africa and over
150.3 million in Latin America (Biyi, 2014). During the past decade, interest in research and production has increased in many countries. The development of new and better varieties is intended to keep up with the pressure of increasing food demand. In Africa, the development of high yielding varieties is intended to address food insecurity and increasing urbanization issues. Among the successes of rice development in Africa has been the release of the New Rice for Africa (NERICA). It is an upland rice variety with high yielding characteristics of Asian species as well as resistant to water stress, pests and diseases of African environment (Kijima, et al., 2006). Its yield has been estimated between 2.5 tons per hectare for low fertile soils and 5 tons for high fertile soils (MINADER, 2001), which is a promising innovation.

Rice is not an indigenous crop in Cameroon but is believed to have been domesticated around 1900 from East Asia (Hyuha et al., 2014; Wiqar Ahmad et al., 2014). However, by mid-1950 and early 1960’s, acreage designated to rice was still insignificant in the country (ADC, 2001). In the 1970’s, considering the growing importance of rice, government initiated a large commercial farm at Ndop and the smallholder farmer managed schemes. These schemes, however, concentrated on production of mainly lowland paddy rice. This variety of rice by its nature grows in wetland and other submerged areas. This, therefore, was not sustainable in the long run and has overtime failed to meet national rice demands (APB, 2014).

In an attempt to save wetlands as well as meet the overriding goals of fighting poverty and improve food security, government and other rural development agencies involved in poverty eradication have actively promoted the New Rice for Africa (NERICA) series which are upland varieties. In Cameroon, NERICA was released in 2002 by National Agricultural Research Institute for Development (IRAD), and many agencies popularised it through demonstration, trainings and provision of seed credit (credit support).

Rice in Cameroon was introduced as far back as the colonial era. Since independence in 1960, Cameroon has enjoyed a better rate of growth in the rice sector. However with the economic crisis and the devaluation in the CFA in 1994, there was a drop in rice prices and Cameroon went to self-insufficiency and depended on foreign importation. Today its production is almost in the hands of small scale farmers who account to about 93% of the total output. In 2014 production supplied 13% of Cameroonians consumption. In Cameroon there are three rice production companies which boast rice production and include (UNVDA) upper noun valley development authority in the northwest, (SODERIM) societe de developement de la rizicultue dans la plaine de mbo in the west region, SEMRY in the far north.

The focus of this work is however not to talk about general rice cultivation in the world but the adoption and productivity of upland rice cultivation of a specific variety NERICA (new rice for Africa) in Bamenda III Sub-Division. The peculiarity of this variety is that unlike other rice species which are cultivated in swamps, the NERICA rice exceptionally survives in uplands.

The high consumption levels in the country and the rest of Africa has been attributed to changing life style and consumer preferences as well as increasing population and urbanization (Nwanze et al., 2006; Norman and Otto, 2002). To address issues of increasing rice demand, government of Cameroon has stepped up efforts to increase production in the country by extensively promoting upland rice. There are signs of payoff for the efforts of government and other private engagement. In three years of introduction, area planted to upland rice is estimated that total rice area and output in the country increased by 10% in 2014, respectively (APB, 2019).

Rice output and hectare has been increasing over time while yield has remained constant. This therefore raises an important question whether the increased promotion of upland rice will be sustainable in the long run since increased output is probably achieved through land expansion. To understand the above question, farm level resource use need to be understood as well as factors hindering realization of desired output levels in rice production. This study therefore seeks to identify factors that are influencing the productivity of upland rice in North West region of Cameroon.

**PROBLEM STATEMENT**

There is an increase demand for rice in the world and most especially Cameroon. Since rice is one of the prominent food today. Office statistics have shown that the average consumption of rice in Cameroon by each household is three times per week especially in Bamenda III subdivision (Agric Post), 2019. Cameroon and Bamenda III in particular have potentials such as swamps and upland plots which could be used to cultivate irrigated rice to meet with the current market demand. Unfortunately, the cultivation of upland rice since its introduction in 2012 is still lagging in Bamenda III Subdivision. Some of the indigenes cultivate irrigated rice which cannot meet potential demand. Even though the yields are higher the quantity produce is not enough to satisfy the market demand in Cameroon. Each year, Cameroon spends 150 billion FCFA on rice importation from China, India, Thailand and Pakistan. Statistics have proven that Cameroon produced only 175,000 tons and imports 475,000 tons to make a total of 650,000 tons (Agric Post). The Ministry of Agriculture and Rural Development has one of its objectives to promote the production of upland rice in the region of Bamenda III Sub-division so as to improve the quantity and quality of rice produced in the country, the people of Bamenda III should adopt the upland rice method as a means to increase the quantity produced in Cameroon. This explains why this research has been put in place in order to give answers.

Cameroon, like most other African countries is a net importer of rice, for instance, a total of 48,925 mt were imported in 2013 representing a value of US$ 13m (Minader, 2014; Khalid N et al., 2014). The increasing demand is largely related to increasing population and urbanization (Kijima et al., 2006).
Rice production in the country has always been carried out in fragile ecosystems of swamps and marshy areas of Eastern and North West regions of Cameroon (ADC, 2001). Production in these areas was never adequate to cover the increasing gap of rice demand in the country. To reduce the deficit, government supported NERICA production across the country even where it has never existed. This promotion is mainly done through demonstrations, trainings and provision of seed credit to support some farmers. This is expected to act as an incentive. The overriding objective for this is to address challenges of food insecurity, poverty in the country.

Despite the widespread promotion, national rice yield has not changed significantly in the last 10 years and has stagnated at about 1.5t/ha (APB, 2014 a). The ever increasing national output can therefore be attributed to land expansion (Hyuha, 2006). This is not sustainable in the long run and might not improve rice sufficiency levels of the country.

To understand how the status quo can be improved, studies that determine farmers related constraints in production need to be identified and corrected as it’s the aim of this research.

**RESEARCH QUESTIONS**

This work is built on the following research question:-

- What are the factors limiting the adoption and productivity of upland rice
- What are the input use levels of upland rice farmers in Bamenda?
- What are the determinants of the productivity of upland rice farmers?
- Which specific socio-economic factors influence the productivity of upland rice farmers?

**SCOPE AND LIMITATION OF THE STUDY**

The study covers Bamenda III sub-division, mostly area of mile 3,4,5,6 and 7 of nkwen .this area is surrounded by mfoyah bafut in the north, muwchu mankon in the west ,bambui in the north east njah in the east, bayelle 2 in the south and mubang in the west .this areas target my population of study which was 90 farmers which were identify in III different quarters in my study area. Under Bamenda III sub-division.

**LITERATURE REVIEW**

A number of studies have been carried out to determine factors that influence efficiency of farmers especially on rice. Farrel’s (1957) pioneer work on production efficiency that assumed constant returns to scale has been under going further improvements to increase the power of estimation (Ogundele and Okoruwa, 2006). Further modification of measurement went on to include other factors that were presumed to affect efficiency.

Lau and Yotopolous (1971) estimated a profit function to determine differences in efficiency between large and small farms in India and found an inverse relationship. Kalirajan (1981) used a normalized profit function in estimating the economic efficiency of farmers growing high yielding irrigated rice in India. He compared large and small groups and concluded that there was no significant difference between the groups. This implied that when small farmers are accessed with inputs they respond the same way to economic opportunities as large farmers. However, he cautioned that this is only possible when institutions ensure equal access to these inputs. Mubarik et al., 1989, using an ordinary least squares estimated profit efficiency among Basamati rice growers in Pakistan. They found that there was general inefficiency of between 5 - 87% and socio-economic factors like household education, non-farm employment and credit constraint and institutional constraint affected farm efficiency.

Institutional constraints identified were late delivery of fertilizers and thus late planting which impact on Productivity of farmers. This method adopted a stochastic frontier approach for efficiency analysis which accounts for random and farm specific errors, however, the current study did not consider institutional factors because they are sometimes elusive (Kirsten and Vink, 2006; Ali, K et al.,2011). In their study of relative efficiency of women and men as farm managers in Cote’ D’ Ivoire, using a normalized profit function, Akinwumi and Kouakou, (1997), found that they both had similar capabilities in farm management given equal opportunities. They also found out that capital and land factors in rice production were highly inelastic (0.04 and 0.2, respectively). The results have a strong message to Cameroonian upland rice farmers especially as regard to capital (seed) that is being extended to farmers. It seems to imply that provision of such inputs has little impact on output. This study therefore also seeks to find whether such inputs to farmers provide an incentive to improve upland production efficiencies.

Kumbhakar and Bhattacharyya, (1992), used a Cobb Douglas by adopting a restricted profit function in estimation of price distortions and resource use efficiency in India. They found that efficiency estimation based on market prices was not adequate because of existence of price distortions leading to imperfect markets and allocative inefficiency. They contended that opportunity cost of resources is not always reflected by market prices and the estimations based on such prices are bound to lead to wrong conclusions. As such, it can be said that prices may not lead to significant differences in estimation since they may be uniform in a given location (Neff et al., 1994). The current study will concentrate on Productivity of upland rice farmers because it gives a representation of farmer practices.

The presence of government support or incentive may affect efficiency of farmers in one way or the other. Zaiyet al (1999), studying on efficiency of government support in horticulture in Oman using both the stochastic production function (SPF) and Data envelopment analysis (DEA), found out that the percentage of efficiency was as low as 17% while using SPF and 46% with DEA. This
study only analysed Productivity and it dealt with a situation where the support was cross cutting. It therefore gives little room for comparison. The two methods used on the same data however give different outcomes which makes it inconclusive. The current study also will model for seed credit incentives and will only use SPF because it has been found to produce consistent results over other methods (Neff et al., 1994; Imran Khan et al., 2011).

Kumbhakar, (1994), estimated Productivity of Bengal farmers and found that best farmers were only efficient to a level of 85.8% and that the majority of farmers were under users of exogenous inputs such as fertilizer, seeds. The under use of resources was related to distortion of markets resulting from government regulations. This study apart from mentioning the effects of distortions did not indicate the percentage of inefficiency that is attributed to state regulations probably because it was beyond the scope of that study.

Sita Devi and Panarasi carried out an investigation entitled “an economic analysis of modern rice production technology and its adaption behavior in Tamil Nadu” The aim of their study was to find the economic and farmers adoption behavior of the system of rice intensification. This study is related to the present one because they both deal with rice production. However they differ in the fact that the present study aims to investigate factors affecting the productivity of upland rice. While the former is based on the attitude of farmers towards the system of rice intensification (K.SITA, DAVI and T. PONNARASI, 2009).

Kwinarajit Sachamarga and Gary W. William 2004 also carried out research on economic factors affecting rice production in Thailand. Their work has as main objective to identify and measure the relative magnitude of effect of the key economic factors affecting Thai rice producers, planting decision using an economic model of the area planted to rice in Thailand. The difference between their study and the present one lies in the fact that they were focused on factors affecting the production of Thai rice. Whereas the present research seeks to find out the factors affecting the productivity of upland rice.

Fedder et al also carried out a research in 1985 on the adoption and diffusion of a technology in a farming population. This researcher stressed out that “adoption takes place only in a long run when the farmer has full information about the technology and its potentials”. These studies is similar to the present one in that they both deal with farmers behaviors’ in adopting a new innovation and technology. The difference between their study and the present work lies in the fact that theirs were carried out in Northern Ghana while the present is carried out in Cameroon Bamenda III Sub-Division.

Witcombe Et Al, 1996 carried out a research on participatory varietal selection where existing cultivars or fixed breeding lines were expose to selection by farmers. This research has two important component which include rice breeding and social science. This research work is related to the present one in that they both deal on rice cultivation. However their work is different to the present in that, they were focused on participatory varietal selection where farmers were to select from a variety of cultivars whereas the present study sees to investigate the factors affecting the productivity of upland rice cultivation in Bamenda 3 Sub-Division.

Bigirwa Et Al, 2005. These two researchers carried out a study on the role of rice in the UGANDAS economy and the period which was made noticed and popular. This researcher point out that even though UGANDA has so many potentials like good climate, fertile soil and political support the rice crop is still new to the country’s farming system. The purpose of their study was to generate basic information on the status of rice production, processing and marketing in UGANDA with a view to guiding decision making in future development initiatives for the rice industry. Their study is different from the present in that, the present studies is based on the factors affecting productivity of upland rice in Bamenda III sub-division while the former studies was carried out on the basic information on the status of rice production, processing and marketing in UGANDA.

DAVID AND BASILICON, 1995. These two researchers carried out research on the production of rice and the income generated from it in the Philippines. Their work had as main objective to know the production of upland rice and the income generated from it by farmers involve in the production process. It also seeks to know the value of upland rice in gross domestic product of the country. This study is related to the present in that they both deal with rice cultivation. Their difference lies in the fact that while the present study is focused on the factors affecting the productivity of upland rice, the former study was on the production of rice in the Philippines and the income generated from it sales.

CHAMBERS AND JIGGINS, 1986. They carried out their research on the evolvement of technology in rice production in India. Their main objective of this study was to study the farmer’s perception on the appropriateness of technology and to what extent it affects the acceptance and adoption of recommended technology. Their research work is related to the present one in that they both deal on upland rice cultivation. The difference between these two works lies in the fact that the present seeks to know the factors affecting the productivity of upland rice in Bamenda III sub-division while the former study was based on studying farmers perception, appropriateness and the extent to which it affects the level of adoption in the cultivation of upland rice in India. Audibert, Kalirajan 1981, 1982. More so this researcher carried out a study on how inefficient are small scale upland rice farmers in eastern INDIA. His main objective here was to estimate the technical inefficiency of small scale upland rice farmers in INDIA. His work is related to the present one in that the two research is talking on upland rice production. However this two research differ in the fact that while the present study talking on factors affecting productivity of upland rice cultivation, the former research work was on the technical inefficiency of small scale upland rice farmers in India.

Kumar Et Al, 2008. These researchers carried out a study on the perception of farmers on paddy rice production technology. Their main aim of this study was to know the perception of the farmers and the adopters in
the production of upland rice. Their work is related to the present one in that they both carried out research on farmer’s perception of upland rice cultivation. The present study is different from their work in that it seeks to investigate factors affecting the productivity of upland rice cultivation in Bamenda III sub-division while their work was focused on investigating the perception of paddy rice production and the technology used in the cultivation process.

Nyanteng, 1985. Furthermore, this researcher did a study on the appropriateness of improve upland rice technology and women involvement in the cultivation. His main objective was to study women involvement in upland rice cultivation in NIGERIA. His work differs from the present in that he was based to know the appropriateness of improve upland rice cultivation technology by women farmers in NIGERIA while the present research seeks to know the factors affecting productivity of upland rice cultivation in Bamenda III sub-division. This two works are related because they both carried out an investigation on upland rice cultivation.

Vav De Ban And Hawkin. In addition these researchers made an investigation on farmer’s perception and factors affecting farmer’s adoption of technology of upland rice cultivation in the Can Tho Province Mekong Delta. Their research had an objective to study the perception of farmers in adopting a new technology in the cultivation of upland rice in the Mekong Delta. Their work is related to the present in that they both carried out research on the productivity of upland rice cultivation. However their work is different from the present in that while they were more focused on the perception of farmers on the technology affecting upland rice cultivation, the present seeks to investigate the farmer’s perception of upland rice cultivation in the Bamenda III sub-division.

Shakya P.B And Flinn J.C (1985) Furthermore these researchers carried out an investigation on the 'Adoption of modern rice varieties and the variety of fertilizer used in Tarai And Napal. These researchers have main objective to know the number of farmers who adopted the variety of upland rice and the varieties of fertilizer used in the cultivation in the above mention country. This study is related to the present in that they both deal with rice production. Their difference lies in the fact that while the present is focused on the factors affecting productivity on upland rice cultivation, the former is based on the adoption of the new variety of upland and the fertilizer used in its cultivation

METHODOLOGY

DESCRIPTION OF THE STUDY AREA

Data for this study were collected from Bamenda III sub-division of Cameroon in the period of October to December, 2019. For this study, Bamenda III sub-division was chosen. This district represents areas where upland rice is relatively newly cultivated and production still timid. The North West region represents an area of significant agricultural potential since it receives high level of rainfall for a longer period of the year, conducive temperature and adequate sunshine has greatly favoured agriculture here. A section of the region lies within the Western rift valley which has fertile young alluvial soils. Because of the high population and land scarcity, rice is grown in some few counties of Bamenda like Ndop menchum, obang and tingo. This are areas which are considered to have more land for expansion. Therefore, the reason for this choice could be related to soil and weather in the rift valleys.

These counties produce a wide range of crops that include; bananas, coffee, and annual crops like beans, maize, cocoyam’s, cassava and rice. Cattle are also a major economic activity in the region and indigenous breeds are predominant. The wide range of crops produced mean that the area consist mainly mixed crop farmers, a factor that may present challenges for upland rice production since it is labour intensive.

SAMPLING PROCEDURE AND SAMPLE SIZE

The study followed a two-stage sampling technique. The first stage involved purposive selection of rice growers in the area of study areas. Within the sub-division, rice producing areas (villages) were purposively selected basing on their production potential. The III rice producing areas of Bamenda III Sub-division where data was collected are represented as follows: Menteh (30), Mbelem (15), and Ntefinki (15). The different sample sizes in the villages were based on the population density of rice farmers that was purposively selected out of three. The area leadership especially agric chief of post and agric extension workers of community projects supporting rice were consulted to generate sampling frame.

DATA SOURCES AND COLLECTION

Primary data were collected from the field through observation, interviews and semi structured questionnaires with household as sampling unit. Both quantitative and qualitative data were collected from the farmers on field (2019). From the field, information on total rice output, inputs like seed, chemicals, labour, and their prices (costs) were collected. Also socio-economic factors like extension contact, age, income, household size and age were collected for analysis. Prices and costs on factors of production were not utilised because the interest of this study was to look at Productivity which utilizes physical quantities.

A well thought out questionnaire was designed to obtain crucial information about upland rice and specifically to address the research questions of the study. The research instrument had both closed and open ended questions that provided necessary checks to ensure correct answers were returned.

The Secondary data of this study was obtained from documentary research in the library of Agric Post Nkwen, information was also gotten from internet research and data was also collected from newspapers (The farmer’s voice).

Upland rice is grown following the two rain patterns received in a year for this region. The first season covers the period of March- June and the second from August – December (main season). Because this crop requires a
considerable amount of rainfall, most farmers in the study area produced rice in the main season of August – December since it has a longer rainy period. Out of the 90 respondents, 60 produced during the main season, while 30 produced only in the first season and thus were eliminated from the analysis. The final analysis considered farmers that produced during the second season that commenced from August to December 2019.

DATA RELIABILITY AND VALIDITY

The research assistants were trained in data collection techniques as well as making them involved in pre-testing the study instrument. They were taken through the dos and don’ts of data collection and then made to practice in the pre-testing. The research instrument was pre-tested to ensure its validity and reliability. Questions that appeared redundant and misplaced were removed and those that the researcher felt were left out due to oversight were included. The instrument had a number of probing questions to ensure consistency of the information received.

After data collection, field editing was done to check out response errors and if possible corrected before leaving a given location. Data were entered in the Statistical package for social science (SPSS) in the agricultural post Bamenda III sub-division to obtain descriptive transformation that can direct and guide the researcher carry out his work without much difficulties. Variables needed for efficiency measurement were then transferred from SPSS to the researcher’s log book to be further analysed to come out with conclusions.

RESULTS AND DISCUSSION

<table>
<thead>
<tr>
<th>Variables</th>
<th>MEAN(N=90)</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Years)</td>
<td>39.2</td>
<td>0.87</td>
</tr>
<tr>
<td>Education (Years of Schooling)</td>
<td>5</td>
<td>0.22</td>
</tr>
<tr>
<td>Household Size</td>
<td>7</td>
<td>0.25</td>
</tr>
<tr>
<td>Farming Experience</td>
<td>19.6</td>
<td>0.86</td>
</tr>
<tr>
<td>Rice Farming Experience</td>
<td>4.4</td>
<td>0.23</td>
</tr>
</tbody>
</table>

SOCIO- ECONOMIC CHARACTERISTICS OF UPLAND RICE FARMERS

A number of socio-economic factors were considered for this study. They included age, education level, household size, general farming experience and rice farming experience. Table 5.1: Socio-economic Characteristics of Upland Rice Farmers

Source: Survey data 2019

Rice production activities such as land opening (cultivation) weeding and spraying requires energy and strength. These activities therefore require youthful vigour and strength to carry out this upland rice cultivation. For this study the average age was 39.2 and therefore can be considered to be still energetic to carry out rice production with rice labour demand.

Education of the farmer plays an important role in decision making and accessing crucial production information which is normally in English. It helps farmers in gaining skills and adapt new technologies. Results in Table 5.1 indicate that the average years in school in the study area were 5 years. This is a primary level of education and with this level of education one can be said to have some literacy and numeracy that is important for production and business transactions.

Agriculture in most developing countries unlike in Bamenda III sub-division rely more on manual labour for production. Upland rice in particular is labour demanding and so household size therefore determines the number of persons available to provide labour for rice production. This may be crucial during peak labour demand periods when the cost of hired labour is high, crowding out resource constrained farmers out of the labour market. In the study area, the average was 7.

Productivity of labour however, does not depend on the magnitude but rather on its ability to engage in production. For instance, a family of seven may comprise of school going children and infants. In that case, only two people in the household are engaged in production. Therefore relative size of a household does not automatically guarantee labour availability especially for school going children, but rather an indicator for potential labour availability. The longer one stays on a particular job, the better that person becomes in terms of skills to accomplish tasks. A farmer, therefore, learns how to adapt to risks and uncertainty with experience. All production techniques can never be got from formal extension education. Therefore, experience plays a significant role in improving production. In this study, the average number of year spent on upland rice production was 4 years. This confirms the fact that upland rice is relatively new to this region and particularly in the Bamenda III sub-division which is also producing upland rice.

THE INPUT USE LEVELS OF UPLAND RICE FARMERS

This examines the current input use status compared to standard recommendation and how it relates to farmer efficiency in production. Inputs considered were seed, fertilizer, herbicides and machinery. Also, services like access to extension education, seed credit and belonging to association were considered.
The inputs used in upland rice cultivation as observed in the table below was improved seeds that were obtained from MINADER for free to all farmers involve in the production of upland rice in the Bamenda III sub-division of the NW Region of Cameroon. From the evaluation carried out, all the upland rice farmers used improved seeds since it was given to them for free by MINADER. Still from the evaluation it was observed that other inputs like fertilizer, pesticide, labour and machineries were limited in supply or inadequate since most of the farmers complained of insufficient fund to purchase this inputs. It can be concluded that the probable reason for the observed low yields could be related to resource utilization especially the yield improving technologies such as fertilizers, herbicides, pest control and non-use of machineries and access to extension education as a major input. Table 4.2 shows input utilization in upland rice in Bamenda III sub-division.

Table 5.2: Input Usage and Service Access in Upland Rice Production

<table>
<thead>
<tr>
<th>Input utilization (n-60) Users</th>
<th>Non-users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Percentage (%)</td>
</tr>
<tr>
<td>Improved seed</td>
<td>81%</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>10.5</td>
</tr>
<tr>
<td>Herbicides</td>
<td>9.7</td>
</tr>
<tr>
<td>Machinery</td>
<td>1.5</td>
</tr>
<tr>
<td>Service</td>
<td></td>
</tr>
<tr>
<td>Access to extension education</td>
<td>36.7</td>
</tr>
</tbody>
</table>

SOURCE: Survey data 2019

THE SPECIFIC SOCIO-ECONOMIC DETERMINANTS OF THE PRODUCTIVITY OF UPLAND RICE FARMERS

This are set to examine upland rice farmers’ Productivity in the Bamenda III sub-division. To determine the productivity of upland rice, some elements which include ages of the farmers which also directly affects man power needed on field works, rice farming experience, seed credit, association to farmer groups, access to extension services, education of upland rice producers which determine productivity were examine to come out with conclusive ideas of the productivity levels. The table below shows the factors determining productivity. This objective aims at isolating some farm specific factors that directly affect the productivity levels of upland rice in the Bamenda III sub-division. These specific factors include age, household size, number of extension contact, educational level and farming experience.

Table 5.3 Showing Ages Of Upland Rice Farmers

<table>
<thead>
<tr>
<th>Factors</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>15-23</td>
<td>8</td>
</tr>
<tr>
<td>25 – 25</td>
<td>10</td>
</tr>
<tr>
<td>35 – 45</td>
<td>7</td>
</tr>
<tr>
<td>45 – 55</td>
<td>25</td>
</tr>
</tbody>
</table>

Source: Survey 2019

<table>
<thead>
<tr>
<th>Educational level</th>
<th>No of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No former education</td>
<td>27</td>
</tr>
<tr>
<td>Primary education</td>
<td>23</td>
</tr>
<tr>
<td>Secondary education</td>
<td>6</td>
</tr>
<tr>
<td>University</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 5.5 showing number of time farmers were visited by extension agents

<table>
<thead>
<tr>
<th>Number of extension contact</th>
<th>None farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension contact</td>
<td>25</td>
</tr>
</tbody>
</table>
Table 5.6 showing farmers farming experience

<table>
<thead>
<tr>
<th>Faming experience</th>
<th>No of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Those with experience</td>
<td>22</td>
</tr>
<tr>
<td>Non experience</td>
<td>38</td>
</tr>
</tbody>
</table>

SOURCE: survey data 2019

From the above tables it can be seen the most of the farmers are of old age which cannot provide the require labour needed in producing upland rice which is labour demanding. From the research it was also discovered that most farmers were not educated thus making it difficult to adopt the cultivation of upland rice. More so it was discover that most of the farmers were inexperience in the cultivation of upland rice due to limited contact with extension agent. This socio-economic factors as observe on field were a great limiting factors to the production of upland rice.

THE FACTORS LIMITING THE ADOPTION AND PRODUCTIVITY OF UPLAND RICE

Factors limiting adoption and productivity of upland rice: Farm sizes, sources of seeds, adoption factors and difficulties encountered by the farmers.

Farm sizes:

FIGURE 1: showing farm sizes

![Farm Sizes Diagram](image)


From the survey, it was realize that most of the upland rice farmers (50%) have farm sizes of 1201m² - 1800m² while 33.33% of the farmers have farm sizes of 601m² - 1200m² and 16.67% of the farmers had farm sizes of 0 – 600m². These farm sizes are influence by so many factors like land tenure systems and high pressure on land.

FIGURE 2 showing farm size

![Farm Sizes Diagram](image)

Figure I: source of seed
From the survey, it was realize that 75% of rice producers in Bamenda III Sub Division obtain seeds from MINADER while 25% obtain seed from UNVDA. This can be interpreted that not only the government through the MINADER is providing seeds to farmers’

**ADOPTION, SEX AND EDUCATION LEVEL**

<table>
<thead>
<tr>
<th>Educational level of the farmers</th>
<th>Adoption</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adopters</td>
<td>Non adapters</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>No formal education</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Primary</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Secondary</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Post-secondary</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Survey Result 2019.

From the table above it is seen that the number of female is more than that of male adopters with no former education while the number of male for non-adopters is more than that of female. In the level of primary education, there are more female adopters and non-adopters than males. As concern adopters with secondary education, there are more females than males while more males than female for non-adopters. Farmers with secondary education have more female adopters than male while the non-adopters there are more males than females.

### 5.8 FACTORS LIMITING THE RATE OF ADOPTION OF UPLAND RICE

<table>
<thead>
<tr>
<th>Adoption Problem/factor</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High pressure on land</td>
<td>24</td>
<td>40</td>
</tr>
<tr>
<td>Culture and belief</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Educational level and profitability</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Inadequate sensitization</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Totals</td>
<td>60</td>
<td>100%</td>
</tr>
</tbody>
</table>

**SOURCE: SURVEY results 2019.**

The factors affecting adoption as seen in this above table is discus as follows:

From the survey, it was revealed by most of the respondent (40%) that the main factor limiting upland rice cultivation is high pressure on land. Since there is an increase in population in Bamenda III Sub-division, upland rice farmers face a lot of difficulties renting or buying land for large scale production by this few farmers turn to adopt the cultivation of this rice specie. More so most farmers have the believe that upland rice cannot be more productive as their normal maize and other crops like cocoyam etc. since this upland rice is a newly introduce variety and has not been cultivated ever.

Most of the farmers here are not highly educated which makes it so difficult to convince them of its importance and its profitability to the Bamenda III Sub-division as a whole and to the farmers as individuals. Inadequate sensitization, since most of the farmers are not aware of the importance of upland rice due to limited sensitization, most of them turn not to adopt this new rice specie.

**DISCUSSION**

From the survey, it was realize that even though there is the availability of seeds from MINADER and UNVDA most of the farmers still face a problem of land accusation which is a limiting factor. From the survey (50%) of the farm sizes were from 1201m² - 1800m² while 33.33% of the farmers have farm sizes of 601m² - 1200m² and 16.67% of the farmers had farm sizes of 0 – 600m². These farm sizes are influence by so many factors like land tenure systems and high pressure on land as seen in figure 1.

Another limiting factor of the adoption of upland rice as observed in the research was level of education and cultural believe. Most of the famers were not educated thus facing difficulty involving in producing upland rice as seen in table 5.4. Most farmers also had the believe that upland rice is not more profitable as their local produce (corn, plantains etc.) thus limiting the adoption.

**INPUT USE LEVELS OF UPLAND RICE FARMS**
From the survey it was realize that inputs like improve seeds were provide to farmers but was not enough to influence the productivity since most inputs like fertilizers, machines, pesticides, fungicides, limited farm sizes and low labour were inadequate for mass production as seen in table 5.2. From the survey, the input use as observe was so low that cannot influence productivity of upland rice in this area.

THE DETERMINANTS OF UPLAND RICE PRODUCTION

The determinant of upland rice productivity as observed in the field were inputs that are the most common factors involve in production which include available farming land, improved seeds, availability of labour, fertilizers, pesticides and fungicides. Most farmers did not have enough farming land, fertilizers, labour and pesticides for mass production which are the most important determining factor thus low output of upland rice in this area of study.

THE SPECIFIC SOCIO-ECONOMIC FACTORS INFLUENCING UPLAND RICE PRODUCTION

The specific socio-economic factors influencing upland rice production as seen from table 5.3 above are based on some farm major input factors like ages of the farmers which most of the farmers were about 45 and above therefore limited man power which cannot meet up with rice production which is labour demanding. Another factor which determine the production of upland rice was farming experience of rice. It was discovered from field that, most of the farmers were inexperienced despite the limited extension services provided to them. This inexperience nature of the farmers’ couple with low level of education showed a low production level of upland rice in the Bamenda III sub-division.

SUMMARY OF FINDINGS

The production of Upland rice in Bamenda III sub-division had as goal to eliminate extreme hunger in the NW region in particular and the country as a whole as a millennium development goal that is important for developing countries. Upland rice production in Cameroon has been identified as a key component in achieving such goal. However, given the low yields and Productivity being experienced in this part of the country, desired results will not be achieved unless efforts of improving Productivity of upland rice farmers are stepped up. As observed in the study, the cultivation of upland rice in the Bamenda III sub-division is still just new to the region and more farmers are still finding it difficult to adopt this new innovation. To achieve rice sufficiency as a country, efficiency improving strategies need to be pursued. The study revealed that increasing rice output can be achieved by a number of factors which include land expansion, availability of improved seeds, abundant labour force both skilled and unskilled, the use of fertilizers to improve yield, insecticides and fungicide to destroy and repel insects, pest and diseases, provision of extension services to educate farmers on the various steps involve in rice production. Seeds that were planted as observe in this study was improve seeds from MINADER and had a positive impact on the productivity even though other factors as mention above acted as set back thus a weaker elasticity which implied that increasing seed quantity planted does not improve on existing output.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSION

It can be concluded that the study indicated a low inputs use that directly affect production like the, use of fertilizers, insecticide limited labour force by the farmer greatly accounted for the low production levels of upland rice in this area of study. More so some socio-economic factors like age, level of education, farming experience of the farmers also contributed to the low output observe in this area of study. The farmers also were lack of knowledge and experience in the production of upland rice since there was inadequate extension workers to constantly evaluate the farmers throughout the production process. As observed from the research, the ministry of agriculture and rural development supported the farmers with improve seeds but it was not enough to improve production since the above mention inputs were lagging. The current effort of universal primary and adult community education in the country should therefore be encouraged and emphasised. Secondly, that the extension services being offered are not appropriate for rice production leading to being ignored by the targeted beneficiaries.

As already mentioned above the production of upland rice in the Bamenda III sub-division is still lagging as most farmers still find it difficult to adopt this new innovation with reason being that rice production is labour intensive and require much capital to purchase inputs in other to realize a better output. As observe from the study the factors influencing production as discussed above need to be addressed in other to meet up with better production levels.

RECOMMENDATIONS

From the research, the researcher recommend the farmers to increase Production of upland rice by acquiring the necessary inputs to improve production and meet up with the demand of the population of Bamenda in particular and Cameroon in general. More so the researcher also recommend the ministry of agriculture and rural development to provide more yield improving seeds and labour saving technologies fertilizers, pesticide, herbicides, fungicide and machines to be hired by farmers in other to increase production. Primary education and specialised extension services that target upland rice need to be encouraged. Therefore the ministry of agriculture and rural development supposed to employ more agricultural technicians and train more extension agents to better train farmers to increase their knowledge on productivity thus improving food security in the country in general.
What is needed is to improve extension coverage from the current level to a better level for farmers to address simple farming abnormalities such as excess utilization if planted seed, fertilizers and inaccessible yield improving technologies. Therefore MINADER need to lay more emphasis to offer targeted and specialised extension services that are appropriate to the needs and aspirations of rice farmer’s needs. Generally, the scope for improving Productivity of upland rice farmers in the Bamenda III sub-division of the North West region of Cameroon is still very timid as compared to other areas producing upland rice. Emphasis should be placed on farmer education and extension education which represent the least cost way of achieving technical efficiency among upland rice farmers in this area.

This study dealt considerably on Productivity of upland rice in Bamenda III sub-division and the factors influencing its productivity. To effectively gain a broader picture of upland rice system in Bameoda III sub-division and how it may improve on rice sufficiency in the region and the country as a whole, the farmers are recommended to improve on production by acquiring large farm sizes, machineries to cultivate in large scale and hence economic efficiency studies need to be provided by MINADER through extension programs to sensitize farmers. With the provision of this farm input both by MINADER and individual farmers as already discussed above, production will drastically increase as this factors will increase output generally thus increasing food security in the region as well as the country in general.

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