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BROILER PRODUCTION AND ECONOMIC WELL-BEING OF POULTRY FARMERS IN BAMENDA, CAMEROON

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ABSTRACT

Broiler production plays a critical role in enhancing food security and improving economic welfare, particularly in rural areas of developing countries. However, the sector faces several structural challenges that constrain productivity. This study aims to identify and prioritize the key constraints in broiler production and evaluate its impact on farmers' economic welfare in the Bamenda Municipality. Primary data were collected from broiler farmers and analyzed using the Two-Stage Least Squares (2SLS) estimation technique to address potential endogeneity. The findings reveal that limited access to finance, high input costs, and insufficient knowledge are the most significant constraints, with 90% of respondents citing lack of knowledge as the primary challenge. The regression results indicate that male-headed households, larger household size, farming experience, and participation in solidarity groups are positively and significantly associated with farmers' economic welfare. Access to quality feed is also positively correlated with broiler output. Despite existing challenges, broiler production demonstrates strong economic potential. Based on the findings, it is recommended to adopt low-cost technologies, strengthen extension and veterinary services, and develop market access and input support systems to enhance farmers' productivity and income.

Keywords : *Broiler Production, Economic Welfare, Farming Constraints*

ABSTRAK

Produksi broiler berperan penting dalam meningkatkan ketahanan pangan dan kesejahteraan ekonomi, khususnya di daerah pedesaan negara berkembang. Namun, sektor ini menghadapi berbagai kendala struktural yang menghambat produktivitas. Penelitian ini bertujuan mengidentifikasi dan mengurutkan hambatan utama dalam produksi broiler serta menilai dampaknya terhadap kesejahteraan ekonomi peternak di Kotamadya Bamenda. Data primer dikumpulkan dari peternak unggas dan dianalisis menggunakan teknik Two-Stage Least Squares (2SLS) untuk mengatasi endogenitas. Hasil menunjukkan bahwa akses keuangan yang terbatas, tingginya biaya input, dan kurangnya pengetahuan merupakan kendala utama—dengan 90% responden menyebut kurangnya pengetahuan sebagai tantangan terbesar. Model regresi menunjukkan bahwa jenis kelamin kepala rumah tangga (laki-laki), ukuran rumah tangga, pengalaman beternak, dan partisipasi dalam kelompok solidaritas berpengaruh positif signifikan terhadap kesejahteraan ekonomi peternak. Akses terhadap pakan berkualitas juga berdampak positif terhadap produksi broiler. Meskipun banyak tantangan, produksi broiler menunjukkan potensi ekonomi yang besar. Adapun rekomendasi dari hasil penelitian ini yaitu perlu adanya adopsi teknologi murah, peningkatan layanan penyuluhan dan kesehatan hewan, serta pengembangan akses pasar dan dukungan input untuk meningkatkan produktivitas dan pendapatan peternak.

Kata kunci : *Produksi Ayam Broiler, Kesejahteraan Ekonomi, Tantangan Peternak*

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INTRODUCTION

The Poultry industry plays a significant role in Mezam division and the economy at large. Poultry sector despite its drawbacks has created unlimited employment to women and youths, it provides about 4 percent of the Cameroon GDP. It also plays an important role in food security in Mezam division and increase the income opportunity for urban and rural population due to its value added opportunities involve in the poultry farming. In Cameroon poultry sector, anecdotal evidence seems to point to the fact that almost all birds consumed in Cameroon are now imported with the sector focusing almost exclusively on eggs production after Cameroon major poultry meat farmers and smaller scale farmers folded up. Poultry production increased by 80 percent during the time period stretching from 2000 to 2007 (FAO, 2014), however the sector is plagued with several problem. Poultry production, which is mainly practiced in rural communities and in most cases serves as major source of income, continues to be crippled by competition from poultry producers from developed countries.

A related and persistent problem in the agricultural sector is that there is some disconnection between the agricultural research capacity and the actual practice of agriculture. Some poultry farmers are semi-literate and do not apply research results or make much use of limited extension services. Instead, they rely on the knowledge about farming passed down from their ancestors. Poultry farmers in Cameroon suffer intensively from competition from heavily subsidized imported birds produced with more expensive modern methods. There exist some modern commercial poultry farms but they are few and are either on the verge of closing down or have already closed down (Oloyo, 2018). The poultry sector, once a promising and a significant contributing sector to animal production and as such the economy of the country, performed well at the turn of the 21st century. From 2000 to 2007 the poultry sector enjoyed an exponential annual growth, especially in the southern regions of the country. The interest of the government in poultry sector has been increasing over the past years. Due to the economic situation of the country, the government has set up programs to train and build up poultry farmers in the value added chain process of poultry production, sufficient materials to carry out these programs were made available using companies such as MEDINO. This has help to reduce the unemployment rate in the economy and promote young youths and women (Oloyo, 2018).

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Livestock is often considered a secondary occupation of many farmers in developing countries. Nevertheless, the important of livestock in the livelihood of the rural people cannot be underestimated. Household lives on subsistent farming, often integrating crop production with livestock rearing, yielding, and multipurpose product and uses (Maikasuwa and Jobo, 2011). However, not all farmers can afford to keep cattle or small ruminants. Poultry is found to have greater outreach to poor than other livestock (Moseley, 1991). Provision of adequate food to their inhabitance and assurance of atmosphere free from hunger and malnutrition is the responsibility of a civilized government. The food security becomes more important when 20 percent of the world population is not getting sufficient food to meet minimum nutritional requirement for healthy and productive life (Petek et al., 2005). Poor nutritional status is prevalent due to lack of insufficient energy and protein in the food or due to insufficient availability of food. The balance diet is essential for good health, and productive capacity of the people. Protein plays an important role in the formation of balanced human diet. There are mainly two types of protein mainly animal and plants.

In Cameroon like many other Sub- Saharan African (SSA) countries, agriculture is the main stay of the economy, employing about 70 percent of the population (Food and Agricultural Organization (FAO), 2014). Agricultural development requires the embracement of farmers' organization to facilitate improved access to productive resource (seeds, breeds, insecticides, fungicides, farm tools, and equipment), capacity building and marketing to production credit (African Development Bank (Saha, 2003). Meanwhile it is widely believe that farmers organization plays a key role in the development of rural community of farmers through the provision of services such as training, productive resource, access to marketing, credit, information to the farmers thereby facilitating the improvement of their income and living condition (Petek et al., 2005). Mack et al (2019) highlighted that farmer's organizations (FOs) contribute in promoting rural development by serving as a framework for sharing information, coordinating activities and making collective decision, and creating opportunities for producers to get more involve in added activities such as input supply, credit, processing, marketing and distribution and one hand and create awareness in view of defending farmers interest on the other hand. According to FAO (2014), farmers' organization need support in overcoming the constraints faced by

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farmers in saving and accumulating asset in coping with uncertainty and risk that are intrinsic to farming.

The poultry industry serves as a source of employment and a source of income to many people. It provides quick capital to investors; this has led to sitting up of commercial and many backyard poultry farms in Bamenda municipality and to contribute to the total amount of eggs and meat production in the country. The poultry sector in Cameroon can be subdivided in to modern and traditional sub sectors. Each of them has their own peculiarities that make them so special with respect to their contribution to national food security. Poultry meat and eggs represent about 10 percent of the total meat produce in the nation. The traditional sub-sector also called rural or backyard production system largely dominate poultry keeping in Cameroon. The subsector is very important for the livelihood of many Cameroonians, contributing up to 10 percent of the income earning of the rural population in contrast to the modern subsector. Which are found mostly in urban and pre urban areas, the traditional poultry system is distributed all over the country. This is due to the fact that there is space for extensive rearing, few socio-economic constraints such as high investment cost and the restriction of the movement of chickens, and the possibility to utilize residues and chicken waste which otherwise will be of little value (Oloyo, 2018).

The traditional sub system comprises 70 percent of the estimate 19 million chickens nationwide, but provide only about 50 percent of the average chicken meat and egg in take of 1.8kg and 20 eggs per capital per year, respectively. It has been reported that about 43 percent of local chickens are used for home consumption, while 34 percent and 23 percent are used for sales and gifts, respectively. Because little care is provided, the sub sector depends on the ability of the local ‘’breed’’ to survive within harsh environments. Yet the protein quality and the erratic income derived from poultry product are necessary to supplement the daily farming activities of the rural population. Chickens are also involved in many social and cultural or religious ceremonies leading to some rituals beliefs. Chickens in Cameroon can generate 1.5million tons of fresh (25 percent dry matter) droppings annually. This dropping is richer in nitrogen, phosphates and potash than livestock manure and more efficient for vegetable gardening and other crop production (Oloyo, 2018). Meats and eggs from local chickens are considered more naturally and tasty for many Cameroonians. The products from the core of traditional hospitality are

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serving as a gift to an unexpected 'important' 'guest. Price-wise a local chicken of the same body weight sells at a higher price than a broiler chicken. Eggs from a local hen sell at a 75 percent higher price than the larger eggs lay by an exotic strain.

Brannius (1997) however report that the interest of people in the industry and effort of the government is gradually being killed due to prevalence of diseases and poor marketing strategies which are regarded major constraints in the industry. Worldwide consumption of poultry produce over the year could increase if the industry could continue to attract a lot more investment. In African countries, egg and chicken are progressively and significantly contributing to relief protein deficiency in food. They represent 14 percent of the population protein requirement in Cameroon and generate more jobs. Poultry today constitute one of a few saving opportunities. In Cameroon, national consumption of chicken increased from 3kg to 4kg / inhabitant/ year of meat, provided the standard of living of the population is raised.

The benefit which the nation derives from poultry cannot be overemphasized. It provides employment, source of income and foreign exchange, which intend contribute to the country's gross domestic product (GDP). It provides food security and protein sufficiency for poor country (Maikasuwa and Jobo, 2011). Unfortunately, the industry in northwest faces a lot of challenges and its prospect are dwindling. To enlighten the decision makers on how to resolve this issue, this study attempts: to identify and rank the main challenges faced in broiler production in Bamenda municipalities, to determine the effects of poultry production on the economic well-being in Bamenda municipalities and to determine the effect of poultry production on the economic well-being by the gender of the poultry farmer in Bamenda municipalities.

LITERATURE REVIEW

Generally, there are four poultry production systems in developing countries and in Africa. These include the free-range system or traditional village system; the backyard or subsistence system; the semi intensive system and the small-scale intensive system (Petek et al., 2005). The most common production system found in Africa are the free-range and backyard production systems (Clark, 2013) and approximately 80 percent of chicken populations in Africa are reared in these systems (Petek et al., 2005). The chicken in this

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system are a function of natural selection. As a result, the performance of chickens under rural conditions remain generally poor as evidenced by highly pronounced broodiness, slow growth rates, small body size and low production of meat and eggs (Leeson et al., 2017). Poultry production systems in Ethiopia show a clear distinction between traditional low input systems and modern production system using relatively advanced technology. There is also a third emerging small-scale intensive system as an urban and pier urban small-scale commercial system (Lathan, 1997). However, the smallholder rural poultry production that predominately exist in the country is characterized as including small flocks, nil or minimal inputs, with low output and periodic devastation of the flock by disease (Settar, 1999).

The present situation in many villages is that poultry left with little or no care. This causes severe fall in productivity. The birds find their feed by scavenging around the houses in the village, and in addition, they might get leftovers from the harvest. As a result, feed is rarely adjusted to the needs of the birds. Young chicks are left scavenging together with adult birds having to compete for feed and becoming an easy prey for predators and spread of diseases. Very often birds do not get enough water, or they get dirty water, which may transfer diseases. Birds are also rarely put in an enclosure or shelter. Nests for hens are rarely provided causing the birds to lay their eggs on the ground even some times in the nearby bush. Furthermore, the system is usually based on hens with the ability to go broody and rear their own chicks. This has many advantages, but the long broody periods reduce egg production (Clark, 2013).

Poultry production has occupied a leading role in the agriculture industry worldwide in recent years. The compound annual growth rate of poultry protein between 2015 and 2025 is estimated to be +2.4 percent. Asia, South America and Africa characterized by rapid urbanization, poverty and hot climate recorded the highest growth increment in poultry production. The trend of continuous growth of poultry production in those regions is obvious because it remains the fastest route to bridging the protein demand-supply gap. Extreme weather conditions in the tropical regions of the world have proven generally detrimental to livestock production and is particularly of interest in chicken because of the latter's high sensitivity to temperature change. Just like mammals, the avian species have the ability to regulate their body temperatures by losing or generating heat in response to

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environmental temperature. If the body temperature of a bird, which normally runs between 39.4 and 40°C, is allowed to increase, the bird will not perform well. Heat stress in poultry production had resulted in under-nutrition, stunted growth, reduction in egg production and size, lying of premature eggs and even death. This problem is further compounded by the high body heat generated by genetically improved laying birds with increased metabolic activity resulting from the high rate of egg production (Petek et al., 2005).

Poultry housing design plays a vital role in the determination of the internal climatic conditions of the house for optimum health, growth and productive performance of the birds. Consequently, the type of poultry housing system employed by the proposed poultry farm is a function of the prevailing climatic conditions of the region where the farm is located. While open poultry house system has been adjudged a good method of housing in the tropical countries because of the Poultry - An Advanced Learning simplicity of its construction, ease of heat management and minimal management cost, the controlled housing system is the most common in the temperate regions of the world. Poultry birds and their thermoregulatory mechanism Birds are warm-blooded ‘homoeothermic’ flighty feathered oviparous vertebrates that possess a high metabolic rate, with a normal breathing rate of 40–50 breaths per minute On the average, birds maintain an internal body temperature of between 39 and 42.2°C. During hot weather, poultry birds maintain thermo-neutral temperature by losing heat mainly through conduction, convection, radiation and evaporative cooling (Petek et al., 2005).

Sensible heat loss through convection, radiation and conduction is only effective if the environmental temperature is below or within the bird’s thermo neutral zone. However, evaporative cooling accounts for about 60 percent of the heat dissipated during body temperature regulation within the thermo neutral zone. Sensible heat loss includes heat loss through opened surfaces such as wattles, shanks and other featherless areas around the neck and wings. Heat loss for body temperature regulation through this process does not alter the bird’s behavioral patterns, feed intake, or metabolism. The effectiveness of sensible heat lost is a function of the temperature difference between the bird and its environment. Where the environmental temperature exceeds 24°C evaporative cooling (latent heat loss) becomes the major method of dissipating heat in birds regardless the age.

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Loss of heat through evaporative cooling at temperatures beyond the thermo neutral zone requires the bird to re-direct energy required for growth and development to panting. However, panting can lead to dehydration and respiratory alkalosis because of inadequate water supply and drop in blood pH due to excessive ejection of carbon dioxide. During panting, evaporative cooling occurs when water evaporates from the respiratory system of the bird. However, this can be hindered by high humidity. This is problematic in high humid environments where poultry farmers employ evaporation cooling as the primary method of air-temperature reduction during the hot periods of the year (Clark, 2013).

Increasing the volume and velocity of air moving over birds enhances heat loss in birds due to convection, removal of heat trapped within the poultry house, and reduction of the effect of high humidity on evaporative cooling. Simmons et al., conducted a study that subjected 3 weeks old male broilers in a controlled environment for 4 weeks toe cyclic temperature of 25–30–25°C at varying wind speed of still air (<0.25 m/s), 2 m/s and 3 m/s. It was observed that the increased wind speed favored older birds in growth and development. Water is an essential commodity in poultry production for the nutrients it possesses and its impact on feed consumption. Nipple drinkers to provide cleaner water reduce water spillage and labour for drinker cleaning has replaced the conventional open water system. May et al., observed that chicken consumed more water when reared with conventional open water system in an experiment that compared the conventional open water system to nipple drinking. However, when these drinkers were used to rear chicken in a controlled room with air velocity of 0.25 and 2.1 m/s, birds in the higher air velocity with nipple drinkers did not differ from those on open water drinkers, but experienced increased weight gain and better feed conversion than birds at the lower air velocity. Therefore, it is important to provide and maintain the required ventilation to ensure that the poultry house is conducive for the birds to regulate their body temperature by sensible heat loss (Clark, 2013).

RESEARCH METHOD

This study was conducted in the Mezam Division, specifically in Bamenda I, II, and III. The primary data was collected from poultry farmers from different cooperatives using structured questionnaires and personal observation on poultry rearing and production. This quantitative data were obtained from 40 broiler farmers selected through stratified random

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sampling across 8 poultry cooperatives. Additionally, qualitative insights were gathered through structured interviews with 15 farmers, direct field observations, and focus group discussions with key stakeholders. Structured questionnaires were designed to capture demographic variables, production data, and key constraints faced by farmers, enabling both ranking and scoring of challenges. The data collected was analyzed using descriptive statistics, for the demographic characteristics, and a regression model to determine the economic well-being of poultry farmers and by marital status. Then, to assess the effect of broiler production on economic well-being and address potential endogeneity, the Two-Stage Least Squares (2SLS) method was employed.

Model Specification

The structural model is defined as:

$$EW_i = \Phi + \lambda BP_{agric} + \psi \pi_i + \varepsilon_i \quad \text{[1]}$$

Where EW_i is the economic well-being which is our outcome variable of interest; BP_{agric} is simply broiler production; π_i represent a vector of exogenous demographics of educational background, age group, level of experience and the size of the farm characteristics while i is the unit of observation of farmers growth and broiler production in Mezam division. In the econometric, λ portrays the actual effect of broiler production on the economic well-being of poultry farmers. In addition, Φ, ψ are parameters to be estimated, while ε is the error term respectively. Given that there can be some biases due to omitted variables, it will be possible that the covariance of BP $_{\alpha gic}$ and the error term (ε) is not equal to zero, hence making our result inconsistent. To redress this situation, we identify an instrument variable M , the instrument is a factor that affects broiler production without directly influencing Economic Well-being, in other words it's a variable that can partially determines broiler production in agriculture but is uncorrelated with the error term. The farmer's economic wellbeing and productivity generating function may take the following structural form:

$$BP_{agric} = \Phi_{PF} + \lambda_{PF} M_i + \gamma_{PF} \pi_i + \mu_i \quad \text{[2]}$$

The instrument use in our study is belonging to a poultry solidarity network, with such an instrument; we can estimate a two stage regression model with the first stage equation as

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indicated in equation (2) above. The consistency of the estimate of $\hat{\lambda}$ relies on the validity of belonging to a poultry solidarity network as our instrument. Thus, as M is uncorrelated with ε, then the instrumental variable estimate of $\hat{\lambda}$ is consistent. Morrill noted that this is fundamentally an untestable assumption. Everything being equal, our model can be estimated by taking the predicted value of women participation in broiler production from equation (2) and substituting it in for economic well-being in broiler production in equation (1) in an IV 2SLS model. Based on the introduction of instrumental variables, three properties of an instrument that need to be noted at the outset. First, an instrument is relevant if its effect on a potentially endogenous explanatory variable is statistically significant. Second, an instrument is strong, if the size of its effect is 'large'. Finally, the instrument is exogenous if it is uncorrelated with the structural error term. An instrumental variable that meets all these requirements is a valid instrument.

Endogeneity can arise due to: errors-in-variables, omitted variables and simultaneous causality. Endogeneity and heterogeneity bias can compromise the validity of OLS estimators. The IV approach is intended to oxygenize the endogenous regressors using valid, relevant and strong instruments and the most commonly used IV estimation method is the single equation approach of two-stage least squares (2SLS) estimators. The strategy for supporting instrument validity, that is we test over-identifying restrictions using Sargan's test statistic (nR^2) which has a chi-square distribution with degrees of freedom equal to (l-q), the degree of over-identification (where n is the sample size, R^2 is from first-stage regression showing the strength of the instrumental variable, l is the number of IVs and q is the number of endogenous variables). This test the null hypothesis that all instruments are valid, hence failing to reject signifies instrument validity. Murray, 2006a shows that the bias of 2SLS approach grows with the number of IVs (l), declines as sample size (n) rises and as the strength of the IVs (R^2) increases. Thus, as long as nR^2 is larger than l, (which will often hold true if the instruments are strong), 2SLS has smaller bias than OLS. Considering the reduce form estimate, we remark that the 2SLS estimate of M can also be thought of as resulting from the division of the reduced form estimate $\hat{\lambda}_{PF}$ below, by the first-stage coefficient derived above M_{PF}. The reduced form equation is the regression of the farmers growth and productivity outcome on the instrument: This actually indicates whether the instrument is correlated with the outcome of interest.

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$$EW_i = \Phi_{PF} + \lambda_{PF} M_i + \gamma_{PF} \pi_i + \sigma_i \quad \text{[3]}$$

Evaluating our endogenous variable, the 2SLS estimate is a reasonable estimation strategy with limited dependent variables and a dichotomous endogenous variable. Since our variables of interest are all continuous variables with a dichotomous endogenous variable, this make our model of instrumental variable robust in terms of estimations.

RESULTS AND DISCUSSION

Socio-economic Characteristic of Sample Poultry Farmers

An analysis of respondent demographics revealed that 52.5 percent were male and 47.5 percent were female. Respondents indicated that poultry farming is labor-intensive and risky, requiring significant courage and resilience—factors that may contribute to the higher male participation rate. Age distribution showed that 45.0 percent of respondents were aged 35–50, followed by 42.5 percent aged 20–35, and 12.5 percent over 50 years. This suggests that the industry is increasingly attracting younger, more energetic individuals, which bodes well for its sustainability and market growth.

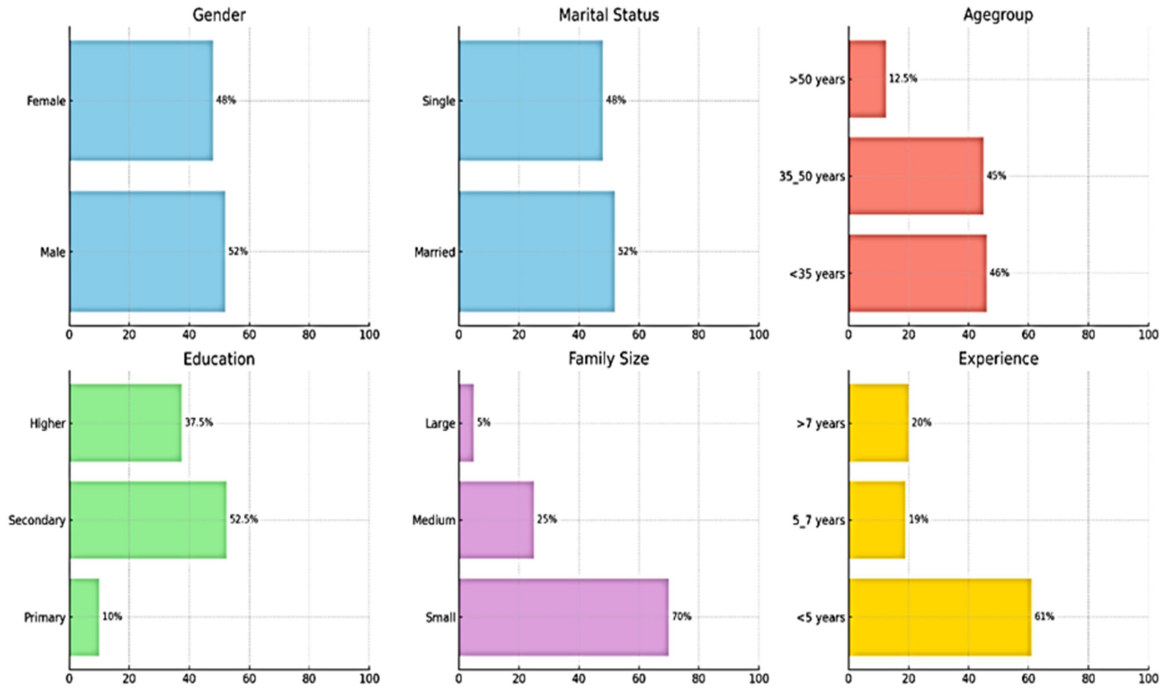

Figure 1. Socio-economic Characteristic of Sample Poultry Farmers
Source: author

Educational attainment showed that 52.5 percent of respondents had completed secondary education, while 37.5 percent had higher education, and the remainder had only primary

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education or none. It is important to note that this refers to formal education, not specific training in poultry farming. The high literacy rate (over 60 percent) suggests strong potential for technology adoption within the sector. Futhermore, regarding marital status, 52.5 percent of respondents were married, while 47.5 percent were single. Married individuals often maintained larger flock sizes, likely to supplement household income. However, women in married households reportedly have limited decision-making power regarding agricultural resources. Most respondents reported a family size of 0–5 children, with a minority having more than seven. In terms of experience, the majority had been engaged in poultry farming for 1–5 years, indicating ongoing development and growing interest in the sector.

Ranking of Challenges in Poultry Production in terms of Severity

There are several challenges faced by poultry farmers during chicken rearing in the study area. The challenges include feed, lack of knowledge or ignorance, theft, limited skill, lack of stock, labor, marketing and climate condition and credit facilities were among the factors critical for chicken rearing. Lack of knowledge and ignorance was a major setback to chicken rearing in the study area. It constitutes 90 percent challenges in Bamenda municipality. Some poultry farmers are semi-literate and do not apply research results or make much use of limited extension services. Instead, they rely on the knowledge about farming passed down from their ancestors. Unavailability of chicken rearing technologies usually prevents farmers from overcoming traditional chicken farming behavior thereby unable to increase income and reduce poverty. The study also suggest that farmers should be initially advised to adopt low cost technologies like chicken housing construction using local materials, vaccinations and feed supplementation in that order as the three have shown to enhance the survival rate of chicken.

Limited access to veterinary, extension services and chicken production skills in the study area is common in most extensive chicken production system, chicken productivity usually increase when proper and timely veterinary and extension services are provided to farmers (Branckaery et al., 2000). The second most pressing constraint of the respondents was identified to be that of high cost feed. Most literature agreed that supplementation for feed for of birds in scavenging type of production system significantly increases their productivity. The above result revealed that feed supplementation affects the farmers'

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decision of birds supply positive. The feed used in catering for the birds, which was important to their growth and development, was expensive to acquire and as such the farmers, in most cases sought to purchase cheaper feed without the right mix of ingredients and concentrates from local suppliers, which was poor in quality and in most cases could lead to mortality of the birds.

Table 1. Ranking of Challenges in Poultry Production in terms of Severity

Variables	NC	C	CD	CD (%)	Ranking
Pest	16	24	-0.2	-20	9
Climate condition	08	32	-0.6	-60	6
Access to feed	24	16	0.2	20	3
Lack of knowledge	38	02	0.9	90	1
Marketing	15	25	-0.25	-25	8
Access to input	27	13	0.35	35	2
Theft	20	20	0	0	10
Labor	21	19	0.05	5	4
Farm products	10	30	-0.5	-50	7
Lack of stock	04	36	-0.8	-80	5

Source; Author, From Fieldwork

Training and extension service held in the study area were other determinate factors to improve poultry production. The result shows that 90 percent of the respondents had no access to training service; on the other hand 10 percent of the respondents had training service. This result indicate that training is one the constraints of poultry production to poultry farmers. About 90 percent of the respondents requested for more training and seminars on general chicken rearing especially on disease control and housing design. They suggested the trainings be conducted by qualified experts from country and national government and non-governmental organization. However 35 percent 0f the respondents requested for input specifically chicken feed, day old chickens, and 20 percent for feed supplements, drug/vaccines and construction of chicken houses. Availability of labor was also a major challenge faced by poultry farmers resulting to 5 percent. Theft was considered the least challenge faced by farmers in the studied area.

Poultry production system is the most important economic activity in rural poor household. It serves as a starter capital stock, source of easily disposable cash income,

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source of protein and also has crucial social and cultural values. Disease is among the most distressing constraints in the production and marketing of poultry product. According to farmers' survey, the respondents pointed out that disease is the most important constraint in the sector. Disease of poultry was unknown to farmers. The only disease reported in poultry was white diarrhea, which could be bacillary white diarrhea or coccidiosis. Incidences of such a condition were reported was reported to be higher in higher birds. Farmers identify sick birds only when the disease has progressed to terminal stage. Secondly with a sick bird is not worth the time spent on informing an extension agents and treatment procedures that ensures. Identification of disease was a major problem for the farmers with most of them for describing that birds die in three to four days after they notice it. Local treatment of white diarrhea using garlic or cinnamomum and red mite with mustard oil were reported to be not always effective. No preventive measures such as vaccination for Newcastle disease were adopted probably due to non-occurrence of the disease over past ten years in this area. Absent of day and night housing, variable inputs and predation and also mentioned economically important challenges in the production and marketing of the birds.

The analysis made for market access to buy production inputs and sale poultry product indicate that 75 percent of the respondents had good market access to procure poultry production inputs and sale chicken, only (25 percent) had poor market access to procure poultry production input and to sale chicken and eggs in the study area. There was limited market problem in the study area because of good availability of infrastructure like transportation facilities and the proximity to town area. More over different traders comes from other town to buy chicken and their products. This was one opportunity for poultry production in the study area. Keeping chicken poultry by smallholders for cash income to purchase food items and cover other family expenses. The smallholder chicken owners found in different parts of Mezam division sell chicken and other input to cover school fee, to purchase improved seed and to gain cash from grain milling services.

About (25 percent) suggested provision for regular market to ensure they get maximum benefits from their chickens rather than being exploited by middlemen. Farmer does not face any competitive market. They face no competition in selling their products so they don't their desired price. Sometimes they sell for very low prices to buyers. They do not

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have any fixed buyer who can buy regularly at a real price. Inadequate stock; parent stock was not available in farm poultry production. Genetic potential is the most important for parents stock. Local variety has not enough growth potentiality. This problem was faced by 35 percent of the famers. Low quality of chick was also identified as a common problem. Local verities of poultry are very sensitive to disease and have a high mortality. If the birds are affected by disease their ultimately lose weight and sometime died. Most of the framers were facing the same problem this shows that farmers from growth problem because of low quality of chick. Lack of stock (poor quality day old chicks). Stocking of poor breeds of poultry is tantamount to waste of effort because such breeds are positioned to get infected with diseases than good breeds. Poor quality day old chicks make the farmers investment less profitable if not complete loss. This confirms the finding of Adetayo et al (2003) who identified inappropriate breeds as one of the major constraints affecting poultry industries. 20 percent of the respondents agreed to this.

Discussion

Linking Poultry Production and Economic Well-being

Based on regression result in Table 2 show that Male Household Head has a significant and positive effect at 1 percent on the farmers' participation decision. This implies that being a male headed household will increase the probability of that family to supply poultry products to the market by 6.13 percent. The coefficient of a male house hold head is positive; this implies that when poultry production is being headed by a male, it leads to an increase in the economic well- being of poultry farmer. It is statistically significant at 1 percent since the standard error is than the coefficient. Majority of the respondents were married, indicating that married household were more involve in poultry farming than unmarried households.

Table 2: Linking Poultry Production and Economic Well-being

Variables	Reduced Form	OLS	IV 2SLS
	Broiler Prod	Economic Well-being	
Broiler Production	n/a	-0.420*** (4.51)	0.511*** (4.25)
Belonging to a solidarity Network	0.003** (2.02)	n/a	n/a
Male household head	0.008*** (4.13)	0.087*** (6.64)	0.145*** (6.13)

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Variables	Reduced Form	OLS	IV 2SLS
	Broiler Prod	Economic Well-being	
Married household head	-0.025*** (14.01)	-0.115*** (9.15)	-0.298*** (6.17)
household size	0.001*** (4.22)	-0.099*** (52.73)	-0.092*** (27.79)
Higher education	0.000 (0.59)	0.000 (0.35)	0.000 (0.76)
Average Household size	0.017*** (8.80)	0.218*** (16.36)	0.313*** (9.78)
Experience in poultry production	0.033*** (15.01)	0.437*** (29.09)	0.664*** (11.16)
Age group 40 and 49 years	-0.006*** (3.02)	-0.071*** (4.85)	-0.117*** (4.90)
Climate change	-0.010*** (4.46)	n/a	n/a
Use of process feed	6.942*** (4.37)	0.133*** (6.41)	-0.120*** (4.52)
Access to input	-0.039*** (23.75)	0.511*** (44.45)	0.219*** (3.23)
Constant term	0.096*** (44.09)	12.729*** (800.87)	13.406*** (80.14)
R^2 /Pseudo- R^2	0.7062	0.5136	0.964
F-Stat [df; p-val]	72.24 [13, 11377; 0.000]	1001.30 [12 0.000]	479.47
F test of excluded instruments/ Joint F / X^2(p-value) test	[12 ; 0.000]		
Angrist-Pischke multivariate F test	n/a	n/a	15.98
Sargan statistic test	[11; 0.0000]		
Cragg-Donald F-Stat	n/a	n/a	31.902
Durbin-Wu-Hausman X^2 test	[0.0000]		
Number of observation	n/a	n/a	15.918

Source: Author, From Fieldwork

This study support the finding that married farmer were more involve in backyard poultry farming that unmarried farmers (Brannius, 1997). This study was significant was 1 percent showing a positive relationship between a married household and unmarried household. According to the respondents a married household with children provide relative family labour, proper planning and easy decision making. Household Size has significantly and positive effect (1 percent) on the farmers' participation decision to sell their products or not. This implies that as the number of family members increased by one of the probability

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of that family to become seller poultry product will increase by 9.78 percent. This suggests that everything being equal family labour is likely to be available in the study area. Majority of the poultry owner's household had a large family size according to the grouping (more than 5 persons per house). This has been a good source of labour in the study area. This support most of the study that confirmed large household size among the farming household where they see family size as a work force that supply the most needed labour requirement for production activities in the study area (Adetayo et al., 2013). Majority of the respondents had been in backyard business for a long period of time. This implies that the sampled respondents were well groomed and experience in the enterprise.

Educational Level has a positive effect on the farmer's production and output which is significant at the high level of education would contribute to the ability for efficient resource management in their business. It also positively affects the farmers' access to useful information that may help them increase their productivity. Education result to change in the overall behaviors, since it is the process of imparting, or acquiring knowledge and habit through instruction or study (Saha, 2003). Over 70 percent of the respondents were educated and had at least secondary school education. This is an incentive for innovation and development in the enterprise. Education is one of the important factors that accelerate growth and development of many enterprises. Only few of poultry owners took poultry production as their major occupation.

Poultry production, male household, average household size, experiences in poultry production and belonging to solidarity was statistically significant at 1 percent level of probability. The coefficient of a married house hold size is negative, implying a negative relationship between poultry production and the economic well- being of the farmers. This means an increase in marital head will lead to a decrease in the economic well-being. Specifically a 1 percent increase will lead to (29.8 percent) decrease in economic well-being. This result is statistically significant at 1 percent. The Coefficient of Average Household Size is positive this indicates that an average household size has a direct relationship with the economic well-being of poultry farmers in the studied area. This is significant at 1 percent probability. This shows that according to the respondents an average household size has an effect on the productivity and the economic well-being of the farmers. An increase in the household size turn to increase productivity and as well as

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their economic well-being by 9.78 percent while a decrease in average household has a negative impact on the productivity as it turn to reduce to labour available as well as the possible resources add from it .

The years of experience are negatively signed and highly significant at 1 percent level of probability which implies that farmers with more years of experience tend to be more technically efficiency in poultry production. Continuous practice for an occupation for a long period presumably makes a person more experience and more productive in practice. This agrees with (Adeoti, 2004), who reported that years of experience reduce farmers inefficiency. The coefficient of age group indicate that if the majority of the respondents falls between the active age group .this implies that young people dominating poultry backyard farming in the study area. This finding was in line with Anang at al (2013) who reported that majority of poultry producers were less than 50years old and as well concur with Ojo (2009) that a negated that a-priori assertion that small-scale farmers in Nigeria were old and ageing (Ojo, 2009).

Climate Change implies that farmers are facing challenges that limit poultry production in the area coupled with adverse effect of climate change due to ever increasing average annual temperature. Farmers lament that inadequate credit facilities is also a major constraint in their quest toward adapting to the effect on climate changing on poultry production. The coefficient of belonging to solidarity is positive and significant at 1 percent implies a strong relationship between poultry farmers and their productivity. Membership to group help farmers to access group credit, share agricultural labour, joint input purchase, joint vaccination against New Castle Disease (NCD), extension service, lobby for favorable agricultural policies and promote unity among farmers. Although being a member to group enhanced access to extension; less than half obtain service from Non- Governmental Organization (NGO) and government (Anang at al., 2013), Feed Supplementation; the coefficient of feed supplementation is positive at 1 percent level of significance. Feed supplement was highly adopted with majority of the farmers using local feed (4.52) and a few using commercial feeds or both local and commercial feed. Respondents also tabled out the high cost involve in commercial feed and its unavailability of the feed in the market implying a direct relationship between the feed and the birds. The coefficient of input is positive and significant at 1 percent probability which implies that

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with low productivity levels, which limit farmers potential for commercialization, the potential of chicken in this area is not fully exploited when compare to the hybrid industrial chicken despite the growing preference for their meat this can be seen at 3.23 percent this study is with accordance to (Ojo, 2009).

Poultry Production and Economic Well-being by Marital Status

The result of poultry production on the economic well-being by marital status is shown on table 3. The study reveals that most of the variable has a decreasing effect on the livelihood of farmer. Specifically education of the household head, access to credit, farming experience and age group were all negatively correlated to the farmer's economic well-being. 10 variables are statistically significant; male household head, educational level, household size, climate change, networking, access to feed, poultry experience. Therefore it is reasonable to conclude as the result shows that, to engage in small scale in poultry production reduces the probability of household head from the result shown.

Educational level of the household head from the result shows that it's also an important determinant of the economic well-being status of the small scale poultry producers, meaning the higher the educational level the lower the economic effect on livelihood. This could be possible because educated farmers have the tendency to learn and adopt a new and appropriate technology for efficient production. The coefficient of poultry production is significant at 1 percent implies that poultry production and economic-well-being has a positive relation with marital status. When poultry production is being headed by married household benefits such as increase in labour, maximum use of resource, optimal utilization of resource and benefit is put in place. An increase in poultry production will increase by 6.23 percent in relation to marital status.

The coefficient of male household head is positivity significant at 1 percent which implies when poultry production is being headed by a male, there is a better chance to expand the business, manage the risks involve and make better decision. An increase in a male household head will lead to an increase in poultry production by 5.43 percent implying the more the male household the improved poultry production will become. This may be due to the high risk involved in poultry business and women are not good risk takers as observed by Anang et al (2013). The coefficient of the married household head is

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significant at 1 percent. It implies that a married household head has a positive impact on poultry production; this is due to available family labour rendered by the family. An increase in the coefficient of married household head will increase the economic well-being of farmers and their productivity by 6.01 percent.

Table 3: Poultry Production and Economic Well-being by Marital Status

Variables	Correlates of Marital Status (IV-2SLS)	
	Married	Single
Poultry Production	0.007***	0.304***
	(4.41)	(6.23)
Male household head	0.050*	0.120***
	(1.94)	(5.43)
Married household head	6.9 42***	10.949***
	(4.37)	(6.01)
Household size	-0.073***	-0.145***
	(25.48)	(37.26)
Higher education	-0.000	-0.000
	(0.98)	(0.66)
Average Household size	0.299***	0.485***
	(9.86)	(13.17)
Experience in poultry production	0.634***	0.842***
	(11.90)	(13.30)
Age group 40 and 49 years	1.130***	1.315***
	(19.95)	(19.85)
Climate change	-0.314***	-0.380***
	(6.97)	(7.33)
Use of process feed	0.133***	-0.120***
	(6.41)	(4.52)
Access to input	0.257***	0.064
	(4.00)	(0.88)
Constant term	13.089***	13.888***
	(115.96)	(80.06)
	0.7560	0.5365
F-Stat [df; p-val]	45.78 [12, 0.000]	47.85 [12, 0.000]
Number of observation	40	40

Source: Author, From Fieldwork

The coefficient of the household size is significant by 1 percent implying that a household size affects poultry production and economic well-being in terms of size. A large household size will affect poultry production as resources will be concentrated on feeding the house rather than buying inputs for the chickens whereas an average household size will be able to maintain and put in more on the poultry. This is will lead to an increase by 3.7.26 percent. The household composition of the respondents includes children and other dependents. This suggests that everything being equal family labor is likely to be available

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in the study area. The coefficient of education was significantly nil implying that educational level has little effect on poultry production. Poultry production does not require a lot of book work or certificate before operation thus a practical experience is more required

Furthermore, the result reveals that the majority of the smallholder poultry operators have higher education with 48.5 percent. This level of education include, advance level, HND and bachelor degree. Minority (22.9) of the respondents has no formal education. The higher level of education will contribute to their ability for efficient resource management in their business. It can also positively affect the farmer's access to useful information that may help them increase their productivity. This indicate that a high level of education will lead to a high level of economic well-being for poultry farmers. The coefficient of the age group is significant at 1 percent indicating that majority of the farmer's falls between 40-49 years. This means that the majority of the farmers are middle age farmers; they are relatively young and fall within the active age bracket. An increase in the young active group will lead to an increase in productivity and the farmer's economic well-being by 19.85 percent. This is with accordance with the economically active population category which is between 25-59 years according to FAO (2014).

The coefficient of farming experience is significant at 1 percent. It implies experience in poultry production has a positive relation with poultry production. When farmers are well trained and development on poultry farming it enables farmers to expand and bring out new technology on poultry production. This will lead to an increase by 13.30 percent in productivity and well-being and also acquisition of new skills and use of technological innovation. Climate change is significant at 1 percent implying the weather has an adverse effect on poultry production and affects productivity of farmers. Due to that farmers find it hard to adapt to the weather condition and also faces difficulties to overcome challenges during this period. This indicates that an increase in weather condition will bring down productivity by (7.33 percent) which will lead to fall in the well-being of the farmers. The coefficient of belonging to solidarity is significant by 1 percent which indicates when poultry farmers engage in cooperative activities or social group it helps to enhance their productivity and well-being by achieving common objectives within members. According to the study, respondents belong to other cooperative societies apart from being a member

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of poultry farmer association. This implies that they have other means to access credit, sell their product or purchase their business; they can also reduce the total cost of operation. Decease in this will lead to a fall in productivity by (4.42 percent).

The coefficient of processed feed is significant at 1 percent. Implying some farmers used processed feed in feeding their chickens while others used local feed. According to the respondents feed production and supplement has always been their major problem, processed feed is hardly available in the market at the same very expensive for the farmers to keep up. Local feed is economical but farmers do not have a better understanding on how to compose a local feed. An increase in the use of processed feed will lead to fall in productivity by (4.52 percent). The coefficient of input is significant at 1 percent which indicates the lack of stock by farmers to carry out their activities and insufficient credit facilities to acquire these materials by the farmers. Through the lack of stock and capital farmers find it difficult to operate and comes out with best results. An increase in input and capital will increase poultry production and the economic well-being of farmers by an increase in 0.88 percent.

CONCLUSION

The study concludes that the most critical constraints in poultry production are limited access to finance, high input costs, and inadequate knowledge—cited by 90 percent of respondents as the main challenge. These are followed by high feed costs, restricted access to inputs, and insufficient extension and veterinary services. Regression results show that male-headed households, larger household size, farming experience, and participation in solidarity groups significantly improve farmers' economic welfare (at the 1percent level). Access to quality feed is also positively associated with broiler output (significant at the 5% level). Despite existing challenges, broiler production in the study area holds considerable economic potential. Key recommendations include adopting low-cost technologies, enhancing extension and veterinary services, and improving market access and input support. Efficiency among poultry farmers could increase by 44% through better resource use and addressing key constraints. The government of Cameroon is advised to subsidize poultry feed to make it more affordable, allowing farmers to access high-quality feed and improve bird growth. Additionally, qualified extension officers should be

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deployed to train farmers on production techniques and feed formulation, thereby improving farmer skills, creating youth employment, and increasing incomes.

LIMITATION AND RECOMMENDATION

This study is limited by a small sample size of only 40 respondents from the Bamenda area and a geographic scope restricted to three Bamenda subdivisions, which constrains the generalizability of the findings to other regions with different socio-economic and environmental conditions. Furthermore, the use of cross-sectional data limits the ability to capture the long-term impacts of broiler production, while potential respondent bias and reliance on a single instrumental variable in the Two-Stage Least Squares (2SLS) method may affect the validity of the results. The lack of in-depth qualitative data also restricts the understanding of the social and cultural dimensions of poultry farming. Therefore, future research is recommended to expand the sample size and geographic coverage, employ longitudinal data to observe temporal changes, and integrate quantitative methods with more comprehensive qualitative approaches. Additionally, incorporating multiple instrumental variables in econometric analysis is essential to enhance the robustness of the findings, alongside adopting data collection techniques that minimize respondent bias, thereby ensuring more comprehensive and valid research outcomes.

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