



## Dairy Development towards Meeting Required Animal Protein intake in Nigeria: a Case Study of Adamawa State-Review

Babale D.M.\*

*Department of Animal Production, Faculty of Agriculture, Adamawa State University, Mubi, Nigeria.*

**Received Date:** 21 March, 2019; **Accepted Date:** 25 March, 2019; **Published Date:** 10 April, 2019

\***Corresponding author:** Babale D.M. Department of Animal Production, Faculty of Agriculture, Adamawa State University, Mubi, Nigeria. Email: [babaled@yahoo.com](mailto:babaled@yahoo.com)

### Abstract

It is estimated that 74% of the population of sub-Saharan Africa is rural. While 15-20% of the population of developing countries does not get enough food, 30-40% suffers from malnutrition. Main dietary deficiency is in protein. Overcoming these problems requires the production of food of high biological value. Milk, which is regarded as the most complete food, can aid in meeting this dietary deficiency. Production, processing and marketing of milk and milk products are options for achieving this goal. This paper reviews dairy development strategies of advanced nations, other nations of sub-Saharan Africa, history of dairy development in Nigeria and Adamawa state in particular. Constraints identified are, low genetic potential of our local stock, insufficient management of nutrition, wide spread infectious diseases of livestock, inadequate clean milk production, preservation and marketing, lack of management of estrous cycle and artificial insemination services, excessive dependence on importation of milk and milk products. To overcome these, it is important that the components of the industry being production, processing, markets and marketing must be taken into consideration. Farmers should be given high guaranteed support prices of milk produced, imports of milk and milk products should be controlled, and export of surplus if obtained should be subsidized backed with advances in production technologies. All this if successfully carried out will have positive impacts on smallholder dairy farmers' incomes and maintain balances between resource availability, integrity and utilization. The end result will be the availability of milk and milk products to nourish our people.

### Introduction

#### Current food situation as it affects Adamawa State

The population of sub-Saharan Africa is estimated to be growing at the annual rate of 3.1% while the urban population is growing at the rate of 6.9% a year (Ray, 1992). The author reported that about 74% of sub-Saharan population is rural but by the year 2020, rural and urban populations are expected to be equal. The rapidly growing population creates rapidly expanding demand for food of good quality such as milk and its products, hence the primary focus for dairy development efforts.

The food supply is inadequate to meet the need of the present population in various parts of Africa, Nigeria and indeed Adamawa state. There is hunger and malnutrition coupled with diseases. According to Webster and Wilson (1980), disease and malnutrition are often interrelated because malnutrition reduces resistance to diseases and delays recovery. The authors stated that food problem has two main aspects—quality and quantity.

It is estimated that 15-20% of the population of the developing countries such as Nigeria does not get enough food to provide for their minimum energy requirements (WHO/FAO, 2006). That 30-40% of the population suffers from malnutrition because of the poor quality of their diets. That only small quantity of animal products is consumed except among pastoralists or where fish is plentiful. The precise nutritional requirements of people in the tropics have not been scientifically established. Human requirement for

protein is currently estimated at 55g per day for adult man and 45g for adult woman. There is higher requirement in various disease state and conditions of stress (WHO/FOA, 2006).

### **Importance of proteins in the peoples' diets**

It is generally accepted that most important and wide spread dietary deficiency of our people is of protein. Total protein intakes are very commonly grossly inadequate and there is often a lack of proteins of high biological value. McDonald et al (1998), defined proteins as complex organic compounds of high molecular weight found in all living cells where they are intimately connected with all phase of activity that constitute that constitute the life of the cells. The biological value is a direct measure of the proportion of food proteins which can be used by animal or human beings for synthesizing body tissues and compounds. It is the proportion of nitrogen absorbed which the animal retains. This is the animal protein which is of high biological value.

According to Abubakar (1992), there is lack of sufficient quantities of animal protein in the average Nigerian and hence Adamawa indigenes diets. He stated that to correct the nutrition deficiencies in the child and adult populations, milk and milk products seem bound to play a leading role because it has high quality protein. This is more especially where protein malnutrition is most prevalent (Olalokun, 1999). This paper is aimed at, among other things, to review dairy development strategies of advanced nations of sub-Saharan Africa, the history of dairying in Nigeria and Adamawa State in particular, constrains and prospects of dairying in the State and offer possible solutions to the constrains.

### **Adamawa state of Nigeria**

Adamawa is one of the 36 states of Nigeria. Its location is in the north eastern part of the country. It has an international boundary with the Cameroon republic along its eastern border. It shares boundary with Taraba State in the south and west, Gombe State in its North West and Borno in the North. The State covers land area of 38,741 KM<sup>2</sup> with a population of 2,102,053 people according to 1991 census. It is divided into 21 Local Government Areas. The State has Tropical climate marked by dry and rainy seasons. Rainy seasons commence in April and ends in October. The mean annual rainfall ranges from 700mm in the North West part to 1600mm in the southern part. Maximum temperature is 40c, is 18c with mean minimum temperature 0f 23.7c (Adebayo and Tukur, 1999). There are two notable vegetation zones in the state, the sub-Sudan and northern guinea savanna zones. The sub-Sudan zone is marked by short grasses interspersed by short tree, commonly found in the Northern parts of the State. To the South, the vegetation is thick with tall grasses and trees (Adamawa State Dairy, 2002).

### **Adamawa State Livestock**

The variety of livestock in the state includes Cattle, Sheep, Goats and Pigs. There are estimated 3.2 million Cattle, 2.5 million Sheep's, and 3.0 million goats in the state (Tukur and Ardo, 1999) totaling 8.7 million ruminants. According to federal ministry of Agriculture Abuja (1994/95), the national ruminants' livestock consist of 17.5 million cattle, 33.5 million sheep and 53.5 million goats, totaling 104.5 million ruminants. Therefore Adamawa State has 8.32% of the national ruminant livestock. Tukur and Ardo (1999) stated that major cattle breeds in the state are Adamawa Gudali, Sokoto Gudali or Bokoloji, Bunaji or Yankanaji and Rahaji or Red Bororo. That the prominent goat breed are Adamawa dwarf and Red Sokoto or Maradi.

### **Adamawa State Dairy cattle and their milk yeilds**

The breeds of cattle that produce milk in Adamawa state are Adamawa Gudali, Sokoto Gudali, Bunaji and Rahaji (Abubakar, 1992). That Adamawa Gudali has milk yeild of 821 liters per lactation of 200 days, Sokoto Gudali has 907 liters in 262 days, bunaji has 930 liters milk yield in 275 days while Rahaji has 480 liters in 195 days RIMS (1992) stated that Red Sokoto or Kano brown goats produces 0.5 liters of milk per day with average lactation period of 100 days. Local sheep (ewe) produces 0.42 liters of milk per day lactation length of 118 days.

### **Dairy and animal protein intake**

Dairy is a set up of consisting of buildings, machines, equipments and personnel where milk is produced, kept and processed into milk (McNitt, 1983), while dairy animal is that which is raised purposely to produce milk. Milk is a white colloidal secretion from the mammary gland used as food for feeding the young. It is the lacteal secretion, practically free from colostrums obtained by the complete milking of one or more healthy cows (Shearer and Boesinger, 1992). Therefore dairying is the process by which quantitative and qualitative milk and milk products are made available to consumers as at when needed. Dairying is a biologically efficient system which converts large quantities of inedible roughage to milk. It is certain to extend a more efficient and intensive system in terms of nutrients and protein production for human consumption from a given area or quantity of feed than beef or sheep farming (Neil, 1992).

Milk is as unique as a balanced source of man's dietary needs (Olaloku, 1999). Some people like the nomadic Pastoralist, Mbororos of West Africa live for months exclusively on milk. The contribution of milk to human nutrition is assessed in terms of its consumption in different dietary situation of communities. That for people in developing countries such as Nigeria its significance lies mainly in its contribution of those nutrients which are not abundant or more easily obtained from cereals, roots and vegetables which constitute the staple diet of the people in these areas. Milk represents one of the best natural sources of essential amino acids (building block of proteins) for human

nutrition. These nutritional attributes of milk it a main stay particularly in the diets of growing children. Koeslag (1986) stated that milk could be regarded as the most complete single food. Though it can be valued on its content of individual's essential nutrients and energy, its value in human nutrition is best assessed by the way in which it complements many diets in different part of the world. That milk provides about 700Kcal of energy, 33g animal protein per liter. That one liter of milk provide man with the same food value as 0.5Kg lean meat or chicken, 1.5Kg of fish or 6 eggs assuming the protein food are being consumed in association with starchy diet. According to Devendra and Mcleroy 1987, goat milk is adequate for infants in essential fatty acids with linoleic acid providing about 1% of total calories. Goat milk is also highly digestible and has high content of phosphorus and Calcium. That dairy goat can be an important resource for the small farm (1-2 ha) where it can supply milk of high animals protein content for immediate family consumption and local distribution.

### **History of Dairy Developments in Advanced Nations**

Africa accounts for just over 2% of world milk production (Neil, 1992). The principal exporters of milk products are the European community (EC), New Zealand and the United States of America (USA), with EC accounting for up to 50% of the total. Only about 5% of world milk is traded internationally. Therefore world prices are highly vulnerable to small changes in demand and supply in the principal producing areas. That these advanced countries gave high guaranteed support prices for their domestic products of milk, they controlled imports of milk and subsidized the cost of exporting their domestic productions. These high guaranteed prices, controlled imports, encouragements for exports combined with advances in technology led to the rapid growth in milk output in these advanced nations. Therefore large surpluses became available for export often at highly subsidized prices and world prices remained low.

The third world countries finding these cheaper sources of milk and milk products resorted to mass importation leading to the neglects of their domestic productions. These world exporters of milk introduced progressive tightening of milk quotas in their countries, leading to about two third reductions in export surpluses. This resulted in rise in prices of milk products from about 600 US Dollars per ton in 1985 to about 2000 US Dollars per ton recently (Neils, 1992). Shahla and Stacey (1992) stated that between 1961 and 1986, sub-Saharan Africa's dairy imports increased six folds, growing at an annual rate of 8%. This trend became a cause for concern because high import growth is difficult to sustain financially.

### **History of Dairy Development in Adamawa State**

According to Abubakar (1992), the Pastoralists have been keeping cattle for centuries long before the arrival of the colonial masters. Milk collection and herding were the responsibilities of the males, while the processing and

marketing were the duties of women who sold the products to supplement family house hold needs. Kofare Dairy farm in Yola, Adamawa State was one of the government efforts on Dairy development, which started in the early 1940. The farm consisted of breeds of indigenous as well as exotic cattle. Due to lack of adaptation of the exotic breeds to our climate, the project collapsed. From then on there has never been any specialized dairy breed of cattle in the State. In an effort of the government to settle the pastoral Fulani in grazing reserves, Mubi and Ngure Dairy farms were set up. The projects could not be sustained due to lack of management. Mubi, Kofare and Ngure Dairy farms had 200, 200 and 300 animals while 8,000, 10,000 and 8,000 ha were under pastures respectively. The remainig facilities at Mubi were handed over to the collage of Agriculture, Mubi. In 1980 there was an attempt to develop Yola milking palour in collaboration with Danish -Turkey Dairy LTD, Denmark, but it was not successful.

In the same year similar dairy development project was implemented at Naivasha dairy development station, Kenya (Muriuki, 2009). The aim was to introduce an intensive dairy cattle managements system, the zero grazing system. It was a project with bilateral cooperation between the Dutch and Kenyan Government with both Government providing financial supports. That because of the positive impacts the project had on smallholder dairy farmer's income, it expanded from an initial six districts to twenty five districts. That altogether the project faced some constraints such as lack of credits facilities, poor marketing infrastructure, deteriorating support such as A.I. and disease control, with limited staff, the project still succeeded.

According to Adamawa State Statistics year book (1997), attempt was again made to re-establish Yola dairy plant in 1985 in collaboration with Trans-world consultant LTD and Alfa-Lawal of Sweden, but again it was not successful. As at present, the only successful dairy farms are privately owned which are Sebare farm along Ngure-MayoBelwa road and Benue valley farm along Yola-Fufore road. These two farms have specialized dairy cattle breeds developed by crossing foreign and local breeds. They produce surplus milk for sales and processing.

### **Strategies for sustainable Dairy Development**

Sustainable Dairy development is a development that meets the needs of the present generation without compromising the ability of the future generation to meet their own needs. Sustainable development must maintain a balance between resource availability, resource integrity and resource utilization (Rattan, 2004). To achieve this, the present and future generation must be conservative and careful in utilizing available resources. Ukagah (2010) stated that, a sustainable growth and development of the livestock industry can only be a reality when the critical needs of the man and his livestock are met in a manner that minimizes the risk of environmental degradation and protect biodiversity. That sustainability

addresses the critical triangle of development objectives of guaranteeing livestock growth and alleviation without endangering the vital ecological equilibrium. That the objectives of public policy should be to exploit livestock resources to meet both the present and the future needs of the populace without endangering the natural resources on which they depend on to improved standard of living for the participant in the industry.

Because of the demographic changes happening in the world today, it is indicative that the needs of the future generation are going to increase many times more. The increasing population will create increasing pressure on the resources. The solution to these conflict lies on this present generation. It is our responsibility for tomorrow, to preserve land and natural resources, ensure continuity food security, protect environment, generate employment particularly for the poor and create a healthy society. To sustain these, we must continue to develop improved technologies that can optimize the use of the existing resources for future needs.

Sustainable dairy development is made possible by keeping breeds of dairy animals that would require minimal and inexpensive external inputs, that are efficient converters of by-products of Agriculture crops and the processed foods, can survive harsh weather and sustain rural environment and are resistant to local and exotic disease. Rattan (2004) stated that dairy animals yielding low volume of milk will suit this requirement since the high yielding milk animals will invariably have high rate of metabolism and would require far better quality of feeds and fodder. Such quality of feeds and fodder must be cultivated, which would then compete for land needed for growing crops for human consumption. The cost milk production on grow crops and fodder would be higher than the cost of milk produced by feeding Agricultural by-products.

Roslaini (2004) stated that there are three phase in dairy development program. **Phase I** is focused on the establishment of milk chilling center for purchasing milk from the farmers. At these centers, basic facilities are created to provide a package of service such as training in animal husbandry, home plot development, Artificial insemination, health care, basic accounting and data maintenance. The farmers are given credit to purchase cattle feeds and milking accessories. Animal breeders are soft loans to facilitate their operations. **Phase II** it is the consolidation phase which provides facilities for pasteurization, marketing of rurally produced milk; improve the efficiency and productivity of the milk chilling centers and the farmers. **Phase III** is the stabilization phase which consists of establishing institutions, buildings, with major emphasis on improving the quality and efficiency of the milk chilling centers and the farmers. The farmers' organization and cooperatives are encouraged to take over the responsibilities of the milk chilling centers.

## **Dairy Marketing**

Dairy marketing is a key constraint to dairy development in sub-Saharan Africa. The rapidly growing urban population creates a rapidly expanding urban demand for milk and is the primary focus of dairy development efforts (Ray, 1992). It is stated by O'Conner (1992) that future dairy development should start at the producer level, to guide rather than drive individuals and cooperatives to solutions of their marketing problems. That it is necessary to refocus investment in dairy marketing to a local producer orientation. This will give rise to more involvement of private individuals and small cooperative in dairy marketing systems. Simple marketing system, featuring small scale producers could play a major role in urban dairy marketing in many sub-Saharan African countries.

Small scale milk processing will only be economical where among other factors, there is a reasonable difference between the farm-gate prices for raw milk and the prices of processed dairy products. Distance of production site from urban market, type of dairy products and its quality, are the factors that influence price relationship of dairy products (Shahla and Stacey, 1992). Prices of locally processed dairy products are nearly uniform in most urban centers. Farm-gate prices vary widely depending on distance from urban areas. Milk is cheapest in areas far from urban markets. If milk cannot be brought to the market within 5 hours of milking, farmers are forced to accept low prices. Milk may be sold by small holders as uncooled or cooled raw milk. It may be transformed into cheese, butter and ghee. Marketing margins per Kg of milk are highest for sour milk. However sour milk is bulky and has a shelf life of less than 4 days. Transportation costs may be too high if the processing is done far in remote areas. In urban and peri-urban areas, it may not pay to go into small scale milk processing if milk can be marketed as sour milk or butter or ghee. O'Conner (1992) stated that people in high income tend to be quality conscious and ready to pay higher prices if the quality warrants it.

## **Dairy products markets and marketing in Adamawa State**

In Adamawa State milk is produced and processed into local products and marketed by the pastoral Fulani women under the traditional marketing system. It is stated that about 2,149 million liters of milk are produced in Adamawa State yearly. Some are consumed by the Pastoralist while some are sold in local markets (Adamawa State Ministry of Agriculture statistics year Book, 1997). It is stated that there is no organized system of marketing dairy products in the state. Under the traditional system, the milk after souring is processed into local products such as kindirmo (fermented whole milk), nono (fermented skimmed milk) and mayin shanu (butter). These products are mainly sold in rural markets. Where the producers are close to urban centers, the products are carried to urban markets for sale. In the state, only few modern dairy plants are involved in organized milk processing to satisfy the needs of urban dwellers. They are mostly involved in production of milk and their reconstitution and recombination of products. In the state, milk productions

are concentrated in the South around Ganye, Jada, MayoBelwa, Yola North and south, Fufure, Girei and Song Local Government Areas. Main marketers for the milk and milk products are Local Government Headquarters and some semi-urban markets in the state. This is because milk is a perishable product. Since they are no storage facilities and rural infrastructure is poor, the produced milk cannot be transported to far places for fear of spoilage.

### **Constraints to sustainable Dairy Development**

Mohammed (2004) stated that genetic potential of the breeds of our animals is the major hurdle to higher milk yield. Local breeds are known more for their tolerance to heat and resistance to disease than for their efficiency of converting feeds to milk and meat. That over the years, few indigenous breeds' genes have been diluted by imported breeds' semen to produce crossed animals. According to Rattan (2004), low productivity of animal as a result of feed shortage, wide spread infections and production diseases, inefficiency leading low productivity, prolonged calving interval and low conception rate are constraints to sustain dairy development. These constraints are as a result of inefficient management of nutrition, estrus cycle and insemination (A.I) services.

Local farmers' productions are constrained by inadequate facilities for milk marketing, high cost of production of milk, low reproductive capacity of animals and loss of production due to diseases. That milk is highly perishable. There are no milk processing facilities. Producers rely on selling raw milk. They cannot realize good and predictable price for their milk. Farmers in rural areas or in remote areas away from cities and towns get minimum milk prices. Milk price near the peri-urban areas is much lower to the producers.

### **Constraints to development in Adamawa State**

Nutrition is said to be the main constrain to dairy development in the state especially in the dry season. The decline in quantity and quality of forage leads to reduced milk output seasonal availability of forage coupled with over grazing and indiscriminate burning reduce grazing land availability. Although grazing reserves have been established, there has been problem of infrastructure, poor management and over grazing due to over stocking. Inadequate disease control and health care management have also been constraints. There has never been any established system of milk products marketing. As stated by Ehoche (1991) and cited by Abubakar (1992), the traditional marketing of milk and milk products constitute about 80% of Dairy marketing. Only a little organized system is found in the state. Milk processing facilities are also not established. Quality of products sold and consumed is not assured. Where facilities are available, it is only on privately owned farms. This leads to milk spoilage and hence wastage. Locally processed products are sold in local markets.

The breeds of milking cattle in this state are characterized by low productive efficiency, low temperature and hence low productivity. Milk let down does not generally take place without the presence of the calf. This lowers lactation yield. However, with improved feeding, breeding and management, these animals are capable of two or three fold production (olayiwole, 1999). Climate factor is also one of those things that limit Dairying in the state. These climatic factor acts directly on the animals and indirectly by their effects on the components of the environment such as nutrition, water supply for stock, disease and management.

There has been great shortage of trained and committed personnel for the dairy industry. Facilities for training are also limited. Inadequate housing for stock is also a constraint. Where housing is available, designs are not made to suit the local environmental circumstances and convenience. Because the industry is not developed, organized milk hygiene and quality control are nonexistent. There are no facilities for milk filtration, cooling, pasteurization, sterilization and products packaging. Dairy development involves large capital investment. Because of low profitability of dairy business, financial house are often reluctant to invest in dairy development. Therefore lack of capital has been a constraint in this sector.

### **Overcoming Constraints to Dairy development**

The primary producer, the producer of the raw material on which the dairy industry is and will always be based, must be advanced, educated and encouraged as to the most efficient and economical way his and his neighbor's milk supplies can be improve, processed and marketed. The primary producers must be led and guided, not driven because without his commitment to the efficient production, processing and distribution of milk products, efforts to organized and develop the dairy will fail (O'conner, 1992).

It is therefore suggested that the way forward in the development of dairy industry, is to realize the importance of its components-processing, markets and marketing and to encourage, lead and advices small holders to pull and manage their resources to achieve greater economic particularly in the areas of processing and products distribution. As the seed of cooperative is sown and germinate, more and more emphasis will be placed on raw milk quantity, product quality and durability (to overcome seasonal surplus) and product diversification appropriate to the needs of the market place. That by pooling their resources, i.e. milk, money, expertise, time and energy, the small holders can benefit economically and socially through greater efficiency at the processing level in addition to saving considerable time by collective marketing.

Government should be keen to increase price per capital daily availability of milk from the current level. To meet the demand for milk by the increasing population, milk production needs to grow. This growth will create opportunities for small

holder producers and generate technical opportunities in milk processing and marketing. To achieve optimum growth rate in dairy industry, several factors need to be addressed. These include the poor genetic base of cattle, feed shortage, wide spread infectious and production diseases and inefficiencies that lead to poor productivity. Farm owners should not overlook the economics of interventions in these factors. It is of utmost importance that there should be assessment of herd status, identification of the general areas of management where interventions are possible for profitability.

Government should intervene in financial and technical support to increase milk production. There should be support to establish commercial dairy farms. Dairy and dairy related products trade and industry should be considered priority areas. There should be better service delivery to milk sheds. Dependence on dried milk should be reduced. There should be proper application of breeding policies.

Dairy is a recognized tool for poverty reduction and self-reliance. Rapid urbanization and steady income growth are the factors that incite demand for milk and milk products. Initiatives should be taken such as increasing milk production through breeding improvement health care of animals, training of farmers in various areas of animal management and giving of financial supports to farmers for dairy development. Considering the importance of nutrient supply, utmost priority should be given to fodder cultivation.

### References

1. Abubakar, B.Y (1992), overview of Dairy industry in Nigeria and strategies for future development. In the Nigerian livestock industry: Problems and prospective-proceedings of workshop on the proposed livestock sub-sector review held in Jos, 26<sup>th</sup> -27<sup>th</sup> February, 1992. Pp 24-37.
2. Adamawa State Dairy (2002). Adamawa State statistic year book (1997).
3. Adebayo, A.A and Tukur, A.L(1999). Livestock: Adamawa State in Maps. Department of
4. Geography, Federal university of Technology, Yola. Published by Paraclete publishers Yola, Adamawa State. Pp 32-33.
5. Devendra, C. and McIeroy, G.B (1987). Goats and sheep production in the tropics. Intermediate tropical Agriculture series, Longman, London Pp 171,214-215,239.
6. Federal Ministry of Agriculture, Abuja (1994/95) Statistics Year Book.
7. Hans, G.P.J (1992) consumption of Dairy products in Northern Nigeria. A seminar paper presented at the symposium on Dairy marketing in Sub-Saharan Africa held at ILCA, Adids Ababa, Ethiopia, 26<sup>th</sup> -30<sup>th</sup> November, 1990.
8. Koeslag, J.k (1986). Dairy cattle production in the Tropics. National Agricultural college Deventer, Netherlands. Printed by RHLS Deventer, Dan fond. Pp 6-11, 149-158.
9. McDonalds, p, Edwards, R.A, Greenhalgh, J.F.D. and Morgan, C.A (1998). Animal Nutrition, 5<sup>th</sup> Edition, Published by Longman, London. P245.
10. McNitt, J.I (1983) Livestock Husbandry Techniques. ELBS Edition, Granada Publications, London. P137.
11. Muhammad, A. (2004) cost effective technologies for milk preservation and processing by dairy small and medium entrepreneurs-A seminar paper presented at symposium on sustainable dairy sector Development for poverty reduction held at Faisalabad, Pakistan 22<sup>nd</sup> -27<sup>th</sup> November, 2004.
12. Muriuki, .H.G (2009). Kenyan National Dairy development project. FAO Corporate Document Repository. ( [2/3/2010.](http://www.)
13. Neil, A.J(1992)an over view of dairying in sub-Saharan Africa. A paper presented at the symposium on. Dairy marketing in sub-saharan Africa held at ILCA, Addis Ababa, Ethiopia, and 26<sup>th</sup> -30<sup>th</sup> Nov. 1990.
14. O'Connor, C.B. (1992) Rural Smallholder milk production and utilization and the future for dairy development in Ethiopia. A paper presented at the symposium on dairy marketing in sub-Saharan Africa held at ILCA, Addis Ababa, Ethiopia, and 26<sup>th</sup>-30<sup>th</sup> Nov. 1990.
15. Olalokun, E.A(1999)Problems and prospect for milk production- proceedings of the international symposium on animal production in the Tropics held at the University of Ibadan 26<sup>th</sup> -29<sup>th</sup> March, 1977 and Edited by J.K Loosli, V.A. Oyenuga and G.M Babatunde (1999), Pp 43-65.
16. Olayiwole, M.B (1999) Feeding and Management of Dairy cows at Shikka, Zaria. A paper presented at the proceeding of the international symposium on Animal production in the Tropics held at the University of Ibadan 26<sup>th</sup> -29<sup>th</sup> March, 1977, Edited by J.K Loosli, V.A Oyenuga and G.M. Babatunde (1999). Pp 147-149.
17. Rattan, S.K (2004) sustainable Development of the Dairy Sector in Asia and the Pacific challenges and opportunities: Seminar paper on sustainable dairy development for poverty reduction held at Faisalabad, Pakistan, 22<sup>nd</sup> -27<sup>th</sup> November, 2004.
18. Ray, F.B (1992) Dairy Marketing in sub-Saharan Africa: Summary and review- proceedings of A symposium held at ILCA, Addis Ababa, Ethiopia. 26<sup>th</sup> -30<sup>th</sup> November, 1990.
19. RIMS (1992) Ruminants Inventory and management surveys: Small Ruminants. Pp160-195.
20. Roslaini, R. (2004) Dairy Development program in Malaysia: seminar on sustainable Dairy Development for poverty reduction held at Faisalabad, Pakistan. 22<sup>nd</sup> -27<sup>th</sup> November,2004.
21. Shahla, S. and Stacey, R.(2004) Dairy imports in sub-Saharan Africa. Proceedings of a symposium held at ILCA. Addisa Ababa, Ethiopia, 26<sup>th</sup> -30<sup>th</sup> November, 1990.

22. Shearer, J.K, Bachman, K.C and Boesinger, J.(1992) the production of quality milk. University of Florida (http:www.)
23. Tukur, A.K and Ardo, M.B. (1999). Livestock A write up in Adamawa State in Maps. Publishers by Paraclete publishers, Yola Adamawa State.
24. Ukagha, A. (2010) Why livestock policies? The functional relationships involve being paper presented at mandatory continuing professional education training for registered animal scientists organized by Nigerian Institute of Animal Science held at Maiduguri, Borno State on the 5<sup>th</sup> of July, 2010.
25. Webster, C.C. and Wilson, P.N (1980) Agriculture in the Tropics. 2<sup>nd</sup> Edition ELBS Longman, London. Pp 104-106.
26. World Health Organization/Food and Agriculture Organization WHO/FAO (2006) Meat Consumption and role of meat in the diet. In meat and health, FAO Corporate Document Repository.

**Citation:** Babale D.M. (2019) Dairy Development towards Meeting Required Animal Protein intake in Nigeria: a Case Study of Adamawa State-Review. Arch Vete Sci Res. AVSAR-109.