**CHAPTER ONE**

**INTRODUCTION**

* 1. **Background of the Study**

People in the world are still undernourished. This is not only because of food deficits and inadequate distribution: the incomes of the poorest are too small to allow them to procure wholesome food in sufficient quantities. Livestock production is a major component of farm economies in developing countries, contributing not only food but also hides, fibres, fertilizer and fuel, as well as a modest, interest-producing capital which can easily be mobilized when unforeseen needs arise (FAO, 2018). In addition, livestock, whether large or small, are part of the social and cultural reality of several millions of small farmers, for whom husbandry represents an element of economic stability and sustainability. According to Edem (2012), both human and livestock populations have grown considerably in the last 30 years, but the rates in developed and developing countries are not comparable. Whereas the global human population has risen by 75 percent since 1960, in the developing countries the rate of increase was 97 percent and in the industrialized countries 28 percent (FAO, 2018). Livestock production is expanding rapidly around the world as considerable increase in demand arises. Recently, livestock producers are faced with the challenge of high cost of feed. The increasing demand of protein have attracted a lot of interest by farmers and researchers in the efficient strategy to employ to boost meat production in the livestock sector (Christopher *et al.,* 2019). Over the years, the demand for chevon, chicken, beef and rabbit meat have increased by 65 percent (FAO, 2018). Although, the price of feed have shifted to a margin that it covers up to 70 percent of the total cost of livestock production (Edem, 2012). The high cost of feed is due to competition of various feed ingredients by humans for consumption and production. In other to maximize rabbit meat production, there is need to be conversant of the best amount of feed required by different classes of rabbits.

Rabbits are known for being prolific, rabbits are also herbivores which efficiently convert fodder to protein (Petracci *et al.,* 2009). The whole point of meat production is to convert plant proteins of little or no use to people as food into high value animal protein. In efficient production systems, rabbits can turn 20 percent of the proteins they eat into edible meat. Rabbit meat production is therefore an attractive proposition, especially when the aim is to produce quality animal protein (Szendro *et al.*, 2015). Rabbits can also easily convert the available proteins in cellulose-rich plants whereas it is not economical to feed these to chickens and turkeys the only animals with higher energy and protein efficiency. Exploring the benefits of rabbits, there is need to boost it production by being acquainted with the best amount of feed required by the different classes of rabbits. The different classes of rabbit include: Buck (mature male rabbit), lactating doe, pregnant doe, dry doe (female not pregnant and lactating female rabbit) and weaner rabbits (Petracci *et al.,* 2009).

**1.2 Problem Statement**

Feed is an important component to be considered when raising animals and specifically rabbits. According to Lawrence (2006), feed constitute about 70-75% of the total cost of production in livestock production including rabbit. Rabbits are pseudo ruminants, they consume both forage and concentrate for optimum growth and physiological functioning. There are published research information on the concentrate intake of wearner rabbits (Adeyemo *et al.,* 2013) but seemingly little information on the intake of forges and concentrate for all the classes of rabbits, hence this research.

**1.3 Justification of the Study**

To remediate the effect of high feed cost on farmers’ profit and to improve the efficient usage of animal feed for the production of quality rabbit meat. There is need to ascertain the actual feed requirement of the different classes of rabbits needed for their metabolic functions; the buck, lactating doe, pregnant doe, dry doe and the weaner rabbits in order to reduce feed cost and increase rabbit production generally. Also, there is seemingly paucity of information on the forage and concentrate intake of the different classes of rabbits to boost animal production.

**1.4 Objectives of the Study**

The main objective of the study is;

* To determine the concentrate and forage intake of the different classes of rabbits namely; buck, weaner, pregnant doe, lactating doe and dry doe.

**CHAPTER TWO**

**LITERATURE REVEIW**

**2.1 Origin and Distribution of Rabbits**

Rabbits are small monogastric herbivore, the rabbit easily accommodates a fairly wide range of cellulose-rich foods; it is highly productive in terms of offspring (kg /year dam) which is attributed to mating-induced ovulation, short gestation and lactation periods and great prolificacy; it produces highly nutritious, low-fat, low-cholesterol meat (Szendro *et al.,* 2015). Rabbits are best known for being prolific and also herbivores which efficiently convert fodder to food. The whole point of meat production is to convert plant proteins of little or no use to people as food into high value animal protein.

In efficient production systems, rabbits can turn 20 percent of the proteins they eat into edible meat. Comparable figures for other species are 22 to 23 percent for broiler chickens, 16 to 18 percent for pigs and 8 to 12 percent for beef. Rabbits can also easily convert the available proteins in cellulose-rich plants, whereas it is not economical to feed these to chickens and turkeys which are the only animals with higher energy and protein efficiency (Tuyttens *et al.,* 2005). The traditional grain and soycakes fed to these domestic poultry put them in direct competition with humans for food. For countries with no cereal surpluses, rabbit meat production is recommended (Hassan *et al.,* 2012).

Rabbit domestication dates back no further than the present millennium. Indeed, the wild rabbit *Oryctolagus cu niculus* of southern Europe and North Africa is thought to have been discovered by Phoenicians when they reached the shores of Spain about 1000 BC. In Roman times, the rabbit was still emblematic of Spain. The Romans apparently spread the rabbit throughout the Roman Empire as a game animal. Several breeds of rabbit were known in the sixteenth century and this is the first indication of controlled breeding. Domestication can therefore be traced to the late middle Ages (FAO, 2018). This was probably mainly the work of monks, since it provided them with a more delectable dish than the tougher wild rabbit. At the beginning of the nineteenth century, after the abolition of seigneurial privileges, rabbit rearing in hutches sprang up all over rural Western Europe and also in city suburbs. European colonial expansion saw the introduction of the rabbit in many countries where it was unknown, such as Australia and New Zealand. In Europe, breeders usually had a few does and a stock of fattening animals, from which they took according to their needs, as from a larder (FAO, 2018). The animals were fed mainly on green forage picked daily. In winter, the breeders supplemented forage with hay, beetroots and even grains, often from stocks intended for large livestock. Rabbits were kept in the backyard, with the poultry. Reproduction was extensive (two or three litters a year). From that time on there is frequent mention of the fur as a by-product (the breed now called Argenté de Champagne was described as "rich", and the already long existing Angora mutant was recorded (FAO, 2018).

**2.2. Economic Importance of Rabbits**

Rabbit production is a rewarding and lucrative investment with high probability of recouping original Investment capital (Onebunne, 2013). It is a veritable way of alleviating animal protein deficiency in Nigeria (Ajala and Balogun, 2004). The rabbit has immense potentials and good attributes which include high growth rate, high efficiency in converting forage to meat, short gestation period, and high prolificacy, relatively low cost of production, high nutritional quality of rabbit meat which include low fat, sodium and cholesterol levels. It also has a high protein level of about 20.8% and its consumption is bereft of cultural and religious bias (Biobaku and Oguntona, 2003). The presence of caecal microbes enable the rabbit to digest large amounts of fibrous feed as most non-ruminant species cannot (Taiwo *et al.,* 2002). Consequently, expansion in rabbit farming will not only generate jobs and income for farmers but will also create small-scale business for market mammies and restaurants (Onebunne, 2013).

According to (FAO, 2018), Rabbit production or keeping is both beneficial to the keeper and the populace as a;

* Major source of meat and protein globally
* Source of employment for it keepers
* Source of income from selling their products: the skin, the meat, the droppings for manure.
* Keeping rabbit is a stock of investment or wealth
* Rabbits serves the purpose of research to constantly improve it utility and productivity.

**2.3. Classes of rabbits**

According to Taiwo *et al.,* 2002, the classes of rabbits is the status of a rabbit which might be denoted by the physiological condition or maturity stage of the rabbit and this include;

Kitten – This is a young rabbit

Buck – This is a mature male rabbit

Doe – This a term used to describe a female rabbit that have given birth

Weaners – This are rabbits that have been separated from the doe and this usually occur at 30-40 days of age.

Dry Doe – This is a female rabbit that is not pregnant nor lactating

Lactating Doe – This is a female rabbit that is tending the kids with milk

Pregnant Doe – This is a female rabbit that is with the fetus awaiting parturition (kindling).

**2.3.1. Bucks**

Male rabbit is known as buck. A buck develops its breeding capabilities at the age of 8 months. An ideal buck maintains its reproductive ability at least for 2 to 3 years. A young buck can mate one doe at an interval of 3 to 4 days. But, from 12 months of age onwards it may mate 4-6 does in 7 days. A buck beyond 6 years of age is culled since semen quality declines. In order to keep the buck healthy additional protein, vitamin and minerals are to be supplemented in diet. Two bucks should not be kept in same place as they will fight each other and cause injury (Vangeel *et al.,* 2000).

**2.3.2. Does**

A female rabbit is known as doe. A doe have the perfectability to reproduce. A doe becomes capable to reproduce based on breed, nutritional status and seasons. The smaller breeds attain sexual maturity earlier than larger breeds. A small breed may accept mating at 3-4 months of age whereas the larger breed may accept mating at 8-9 months of age (Szendro *et al.,* 2015). A doe can be used for breeding up to the age of 3 years and culling afterwards (Vangeel *et al.,* 2000).

**2.3.3. Pregnant Does**

A pregnant doe is a female rabbit that have mated with the buck and confirm to be with an embryo. The gestation period pregnancy of a rabbit is approximately 31 days. This period can range by up to two days either way. Since baby rabbits are extremely small, it can be very difficult to tell if a rabbit is pregnant. The most common technique to determine if a doe is pregnant through palpatition (Szendro *et al.,* 2015). If the doe is pregnant, you may be able to feel the embryos by palpating her abdomen 9–14 days after breeding. It is not recommended that you palpate the doe after 14 days as the developing fetuses could be injured. Pregnant rabbits have higher nutritional requirements than rabbits of the same age and size that are not pregnant (Dry doe). If a doe is pregnant, you should begin to increase her feed two weeks after the initial breeding to keep up with her nutritional needs (Vangeel *et al.,* 2000). Pregnant does apparently requires high protein to support the growing babies.

**2.3.4. Lactating Does**

After kindling, the does release milk from its mammary gland as a primary food to sustain the kits. Lactating does requires rich feed as they produce milk three times richer than cow's milk, at the rate of 100 to 300g per day, and have few reserves in relation to the demand made on them (Szendro *et al.,* 2015). During the course of nursing her young, lactating does deserves higher nutritional requirements than when she was pregnant. Nutritious feed should be maintained until three to four weeks after kindling, and then it should be reduced back to normal to coincide with weaning (Branckaert *et al.,* 2003).

**2.3.5. Weaner rabbits**

Rabbits that are separated from the mother are usually referred to as weaner rabbits. Weaning can take place when the rabbit's live weight is 500 g (after approximately

26 to 30 days in rational European production). The young rabbits begin to eat solid feed at 18 to 20 days and at 30 days the doe's milk provides no more than 20 percent of the daily dry-matter intake. During the weaning period, the young gradually give up milk for solid feed. Weaning is the time the young kit is separated from the doe. The major weaning methods include: withdrawing all rabbits in the litter at the same time and placed six to eight per cage in the area set aside for fattening. Alternatively, removing the doe from the cage and the young rabbits left, a method which reduces post-weaning stress for the young rabbits (Branckaert *et al.,* 2003). During weaning, the health of the young rabbit is usually inspected, culling any that are undersized or sick.

**2.4. Feed and feeding of rabbit with concentrate and forages**

Rabbit requires nutritious and balanced ration comprising of energy, protein, vitamins, minerals, water and roughages to enhance it growth and development. Poor feeding decreases productivity of the animal. A vast array of literature on nutrition-reproduction interactions shows that good feeding increases milk production of lactating animals. It also increases growth rate of meat producing animals, giving more meat. Good nutrition increases reproductive efficiency: higher cyclicity, higher productive life and higher profitability to farmers (FAO, 2018). Furthermore, evidence of good performance exist showing that nutrition has impact on productivity and health of off-springs later in life (Bell and Greenwood, 2016).

Aside from concentrate feed, rabbits are also raised with grasses, legumes, Crop residues and agro-industrial by-products such as; wheat offals, rice bran, palm kernel cake, etc (FAO, 2018).Young branches from trees such as acacia, Bran mash (bran is produced from the milling of wheat or rice) as rabbits have the capacity to efficiently utilize protein in cellulose-rich plants (Petracci *et al.,* 2009). During the dry season, rabbits can be fed with Hay which is derived from green leafy plants. Hay is made by baling the plants into bundles and hang them to dry in the wind avoiding direct sunlight and this is preferable for rabbits (Ezea, 2004).

Aside from concentrate and forages, rabbits also ingest it soft feces. Rabbits produce both hard and soft droppings. The soft pellets are recovered by the rabbit directly upon being expelled from the anus. The rabbit twists itself round, sucks in the soft feces as they emerge from the anus, then swallows without chewing them and this phenomenon is referred to as caecotrophy (Branckaert *et al.,* 2003). Caecotrophy first starts to function in young rabbits at the age of about three weeks, when they start eating solid feed in addition to mother's milk. The rabbit can retrieve the soft pellets easily, even from a mesh floor. The soft pellets follow the same digestive process as normal feed. Considering the fact that some parts of the intake may be recycled once, twice and even three or four times, and depending on the type of feed, the rabbit's digestive process lasts from 18 to 30 hours in all, averaging 20 hours. The soft pellets consist half of imperfectly broken-down food residues and what is left of the gastric secretions and half of bacteria (Branckaert *et al.,* 2003; Hassan *et al.,* 2012). The latter contain an appreciable amount of high-value proteins and water soluble vitamins. The practice of caecotrophy therefore has a certain nutritional value. The composition of the soft pellets and the quantity expelled daily are relatively independent of the type of feed ingested, since the bacteria remain constant. In particular, the amount of dry matter recycled daily through caecotrophy is independent of the fibre content of the feed (Hassan *et al.,* 2012). It is natural for the rabbit to eat the soft droppings it produces because they contain nutrients (amino acid) and water. When the soft droppings pass through the digestive gut for a second time the nutrients and water can be absorbed (taken into the body). The droppings produced then will be hard.

Conclusively, Adeyemo *et al.,* 2013 observed that for optimum performance of rabbit, they should be fed mixture of concentrate and Forage. Inclusion of forage in the diet of rabbit is also needed to enhance feed intake. For optimum performance of rabbit, they should be fed 50% of concentrate and 50% of forage because it was this percentage that gave highest weight gain and highest average weight gain. Hence, Rabbit requires nutritious diet for optimum production.

**2.4.1. Effects of Physiological Status of Rabbits on Concentrate and Forage Intake**

According to the oxford dictionary, Physiological status refers to the health condition of any organism. An animal can either be healthy or sick. Aside from the aforementioned, physiological status of animals can also include; lactation, heat and gestation period (EFSA, 2020).

Animals that are on gestation periods are reported to require more concentrate feed compared to forage which is attributed to the development of the fetus (Trocino *et al.,* 2019). Gestation rabbits is reported to consume more leguminous forage in it gestation period to benefit it fetus and high amount of grasses few days to parturition to provide energy for the process (Trocino *et al.,* 2019).

Additionally, lactating rabbits are also reported to consume more concentrate only when available to complement forage (Zomeno *et al.,* 2018). In the separation of forages, lactating rabbits are also reported to consume more legumes than grasses and the reason for this quite simple, thus, provide more milk for the suckling kitten.

(Zomeno *et al.,* 2018).

Weaners rabbits also requires more legumes to build muscle tissue and growth compared to it requirement of concentrates, while Bucks are reported to require their ration for maintenance (Trocino *et al.,* 2014; 2018)

**2.4.2 Effects of Breeds of Rabbits on Concentrate and Forage Intake**

There are numerous breeds of rabbits around the world and these breeds varies with body weight, body size, coat colour, amount of fur and litter sizes inclusively (Cartuche *et al.,* 2014). The common breeds of rabbits include; New Zealand White, California white, Chinchilla, Dutch, among others (Trocino *et al.,* 2014).

According to reports, the body weight is the major determinant of either the amount of forages and concentrate required breeds of rabbits

**2.4.3 Importance of feed to rabbits**

Like other livestock, rabbits need a balanced diet containing all the necessary nutrients; energy, protein, vitamins, minerals, water and roughages. Proper nutrition gives animals the vigor to grow, develop, and reproduce, and build immunity to eliminate infections (Tuyttens *et al.,* 2005). All these advantages lead to more profitable and sustainable agriculture, which invariably increases rabbit production.

Starving animals of essential nutrients can cause either malnutrition or minerals and vitamin deficiencies (Hassan *et al.,* 2012). Deficiencies and malnutrition severely impact animals’ growth, development, and production; some extreme cases can lead to irreversible health conditions, disorders, or even fatalities.

**CHAPTER THREE**

**MATERIAL AND METHODS**

**3.1 Experimental site**

The study was carried out in the Rabbitry Unit of the Department of Animal Science of Akwa Ibom State Univeristy, Obio Akpa, Oruk Anam Local Government Area, Nigeria, a tropical ecological zone. The area lies between latitude 4030’N and 50 00’N and longitudes 700 30’E and 800 00’E of the Greenwich meridian. The area is in the hot humid tropics with a climate characterized by two seasons (rainy and dry season). The rainy season spans between April and October, while the dry season spans between November and March. Temperature are uniformly high throughout the year ranging between 26oC and 28oC. Solar radiation ranges from 4.11-4.95mm, partly because of the values of insulation and temperature (SLUS-AK, 1989).

**3.2 Experimental Animal, management and design**

A total of 25 rabbits were used for this experiment. The animal were grouped into five classes, each class comprising of 5 rabbits.

Group I were adult female rabbits (dry does) from 8 months and above that were not pregnant nor lactating.

Group II comprised of adult female rabbits (pregnant doe) about 8 months and above which were confirmed to be pregnant.

Group III were of adult female rabbits (lactating doe) that just kindled and lactating which were about 8 month and above.

Group IV were adult male rabbits (buck) of about 8 months and above.

Group V made up of young rabbits (weaner) of 6-8 weeks of age.

The rabbits were managed under the intensive system in individual hutches and fed with known quantity of both concentrate and forages (grasses and legumes). Routines management practices in terms of sanitation and medication were strictly adhered to.

**3.3 Experimental Diet**

Each group of rabbits were fed with known weight of concentrate and forages ad-libitum for six weeks. The nutrient composition of the concentrate and the forages given is shown in the tables below;

**Table 3.1: Nutrient composition of the concentrate feed**

|  |  |
| --- | --- |
| **Nutrients** | **Composition** |
| Crude protein (%) | 19 |
| Ash (%) | 10 |
| Gross energy (kcal/kg) | 2800 |
| Crude fibre (%) | 6 |
| Calcium (%) | 0.95 |
| Phosphorus (%) | 0.65 |
| Crude fat (%) | 8 |

**Table 3.2: Forages given to the rabbits**

|  |  |
| --- | --- |
| **Common Name** | **Scientific Name** |
| Puero/kudzu | *Pueraria phaseoloides* |
| Centro | *Centrosema pubescens* |
| Pig weed | *Alternenthora bettzekiana* |
| Calopo | *Calopogonuim mucunoides* |
| Elephant grass | *Penisetum purpureum* |

**3.4 Data Collection**

A weighed quantity of concentrate and forage were fed to the rabbit ad-libitum. The left-over was weighed in the morning to know the quantity ingested by the animal. The feed intake was calculated as the difference of feed given and the leftover. The body weight of the different classes of the rabbit were also obtained.

**3.5 Data Analysis**

The data obtained was subjected to analysis of variance (ANOVA) in a completely randomized design (Steel and Torrie, 1980) and the significant means were separated by applying Duncan multiple range test as outlined by (Duncan, 1955).

**CHAPTER FOUR**

**RESULTS AND DISCUSSION**

**4.1 Concentrate Intake of Different Classes of Rabbit**

The concentrate intake of the experimental animal is presented on Table 4.1.

It was observed that the lactating does consumed (p<0.05) higher concentrate that other classes of rabbit during the experiment, followed by the pregnant rabbit (Group 3) and lesser feed intake was observed with the weaner class of rabbits. The higher feed (concentrate) intake by the lactating and the pregnant rabbits could be attributed to the physiological state of the rabbits. The pregnant and lactating rabbits consumed the feed to satisfy their own nutritional needs, that of the developing fetus and the sucking kittens respectively. This report is in agreement with the report of Adeyemo *et al.,* (2013).

**Table 4.1: Concentrate Intake of different classes of rabbit (g)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Weeks** | **T1**  **(Bucks)** | **T2**  **(weaner)** | **T3**  **(Pregnant)** | **T4**  **(Dry Doe)** | **T5**  **(Lactating)** |  |
| **1** | 261.40c | 239.11 d | 264.90 b | 260.71 c | 287.14 a |  |
| **2** | 262.51 c | 248.00 d | 271.63 b | 264.54 c | 287.36 a |  |
| **3** | 255.86 c | 243.00 d | 268.91 b | 260.71 b | 285.51 a |  |
| **4** | 261.29 c | 239.83 d | 275.03 b | 273.51 b | 285.21 a |  |
| **5** | 253.43 d | 221.29d | 273.50 b | 267.51 c | 289.29 a |  |
| **6** | 262.89 c | 238.71 d | - | 273.02 b | 289.29 a |  |
| **SEM** | 259.56 | 238.32 | 270.79 | 268.17 | 286.60 |  |

**\*SEM – Standard Error of Mean \*a, b, c means in a row with different superscript are significant different (P<0.05)**

**4.2 Forage Intake of Different Classes of Rabbit**

The result of the forage consumed by the various classes of the rabbits are shown on Table 4.2. Forage intake by the different classes of rabbits was observed to follow the same pattern of the concentrate intake. The pregnant and the lactating mother had significantly (p<0.05) higher forage intake than other classes of rabbit, while the weaner also consumed he less forage. The high intake forages by the lactating and pregnant doe could also be attributed to the higher energy plain required by these two classes of rabbit for their physiological state (pregnancy and lactation). The lactating and pregnant does required high energy to their unborn suckling kittens and sustain the rabbit respectively. The reason for the high intake of forage could also be due to the fact that gasses are low in energy and the animals need to high quantity of forages in order to derive the energy required for their daily allowance. This agrees with the findings of Adeyemo *et al.,* 2013.

**Table 4.2: Forage Intake of different classes of rabbit (g)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Weeks** | **T1**  **(Bucks)** | **T2**  **(weaner)** | **T3**  **(Pregnant)** | **T4**  **(Dry Doe)** | **T5**  **(Lactating)** |
| **1** | 183.20b | 173.06 e | 178.03 c | 175.43 d | 188.00 a |
| **2** | 177.23 b | 146.14 d | 175.91 b | 171.11 c | 188.43 a |
| **3** | 178.37 c | 159.63 e | 183.00 b | 177.00 d | 192.86 a |
| **4** | 175.63 c | 149.09 d | 183.74 b | 177.29 c | 190. 86 a |
| **5** | 174.37 d | 154.23e | 179.40 b | 177.66 c | 192.86 a |
| **6** | 182.77 b | 156.69 d | - | 177.09 c | 190.36 a |
| **SEM** | 178.60 | 156.47 | 180.02 | 175.26 | 190.56 |

**\*SEM – Standard Error of Mean \*a, b, c means in a row with different superscript are significant different (P<0.05)**

**4.3 Body Weight**

The result of the weekly body weight of the experimental animal are presented in Table 4.3. After the experiment, the lactating rabbit was observe to have a significantly (p<0.05) higher body weight among the classes of rabbit. The value was followed by the pregnant animal and the less body weight was obtained from the weaner group class. The higher body weight of the lactating does could be as a result of the pregnant lactating hormone (progesterone).

**Table 4.3: Body Weights of different classes of rabbit (g)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Weeks** | **T1**  **(Bucks)** | **T2**  **(weaner)** | **T3**  **(Pregnant)** | **T4**  **(Dry Doe)** | **T5**  **(Lactating)** |
| **1** | 2115b | 715.00 e | 2014.60 c | 2000.60 d | 2904.00 a |
| **2** | 2205 b | 818.00 d | 2058.00 d | 2144.00 c | 2896.00 a |
| **3** | 2211 c | 966.00 e | 2696.00 b | 2207.00 d | 2849.00 a |
| **4** | 2219 c | 1388.00 d | 2878.00 a | 2218.00 c | 2820.00 b |
| **5** | 2228 b | 1434.00d | 2937.00 a | 2219.00 bc | 2211.00 c |
| **6** | 2220 a | 1503.00 d | - | 2219.00 b | 2196.00 c |

**\*a, b, c means in a row with different superscript are significant different (P<0.05)**

**4.4 Weight Gain, concentrate and Forage Intake of Different Classes of Rabbits**

The result of the weight gain is presented in Table 4.4. It was observed that the pregnant rabbit (Group 3) had significant (p<0.05) higher weight gain than other classes of rabbit, followed by the weaners, while the lactating does had a negative weight gain indicating lose in weight. The high weight gain for (Group 3) could probably be as a result of the developing foetus in the mother. The increase in weight gain of weaner rabbits could also be attributed to the growth hormones. The negative weight gain in the lactating doe is as a result of drain from the suckling kittens.

**Table 4.4: Weight Gain of Different Classes of Rabbits**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **T1**  **(Bucks)** | **T2**  **(weaner)** | **T3**  **(Pregnant)** | | **T4**  **(Dry Doe)** | | **T5**  **(Lactating)** | | **SEM** |
| **Total Conc. Intake (g)** | 775.38c | 698.04d | 819.18c | 1527.72b | | 1669.80a | | 110.42 | |
| **Av. Daily Conc. Intake (g)** | 18.46d | 16.62d | 27.31c | 36.37b | | 39.76a | | 2.48 | |
| **Total Forage. Intake (g)** | 530.00c | 451.92d | 529.83c | 1048.59c | | 1116.78a | | 76.38 | |
| **Av. Daily Forage Intake (g)** | 12.62d | 10.76e | 17.66c | 24.97b | | 26.56a | | 1.70 | |
| **Initial Body Weight(g)** | 2115b | 715.00 e | 1814.60 d | 2000 c | | 2904.00 a | | 9.76 | |
| **Final Body weight (g)** | 2229b | 1503.00 e | 2937.00 a | 2219.00 c | | 2196.00 d | | 9.22 | |
| **Weight Gain(g)** | 114 c | 788.00b | 1122.4 a | 218.40 d | | -708.00 e | | 9.49 | |

**\*SEM – Standard Error of Mean \*a, b, c means in a row with different superscript are significant different (P<0.05)**

**CHAPTER FIVE**

**CONCLUSION AND RECOMMENDATION**

**5.1 Conclusion**

Rabbits are one of the most important livestock and regarding its economic importance as source of animal protein as a nutritional contribution to human diet, means of employment and source of income to the keeper. Rabbits also mature early, their meat has high protein, low fat, low energy and low cholesterol. The level of animal protein consumption has direct influence on the general well-being and health of the ever increasing population. Animal protein is usually obtain from cattle, sheep and goats. However, these animals have not been able to close the gap of protein shortage because of their long production cycles and some other factors. According to Adeyemo *et al.,* (2013), rabbits are highly prolific animals and when given judicious management, they can kindle about six times in a year with average of 6-7 young per kindling. In the view of increasing demand for animal protein consumption and shortage in supply of animal protein attention has been recently diverted on rabbit production. Rabbit production can be increase by provision of exact amount of feed required by different rabbits to meet it nutritional requirement.

**5.2 Recommendation**

Conclusively from the experiment of evaluating the forage and concentrate intake of rabbits, it can be deducted that lactating and pregnant rabbits requires a huge quantity of both forage and concentrate, hence they should be provided with high quantity and quality feed to meet it physiological status. Weaners should also be provided with sustainable amount of feed for it growth and development.

**REFERENCES**

Adeyemo, A., Adeyemi, O., Ekunseitan S. and Taiwo S. (2013). Effect of Concentrate to Forage Ratio on the Performance and Haematological Parameters of Growing Rabbits *Global Agricultural Science*, Vol*.****2*** *(2):114-118*

Ajala M. and Balogun K. (2004): Economics of Rabbit Production in Zaria, kaduna State*. Tropical Journal of Animal Science,* **7** (1); 1-10.

Bell, A.W. and Paul L. (2013). *Optimizing maternal cow, grower and finisher performance in beef production systems*. In: Optimization of feed use efficiency in ruminant production systems.

Bell, A.W. and Greenwood, P.L. (2016). Nutrition during gestation influences postnatal productivity of ruminant livestock. Broadening Horizons 30, Feedipedia

Biabaku, W. O. and Oguntona, J.K. (2003). Utilization of different Protein Source for Growing Rabbits Pertanica, *Journal of Tropical Agricultural Science,* **26**(1) pp. 78-96.

Branckoert E., Egwin, K., Jose, G. (2003). Tropical Rabbits Evaluation: A Review. World *Rabbits Science*, 234, 65-87.

Cartuche, L.; Pascual, M.; Gòmez, E.; Blasco, A. (2014) Economic weight in rabbit meat production. *World Rabbit. Sci.,* 22, 165–177.

Christopher, G.I., Sam, I. M.and Essien. CA. (2019). The potential of monkey cola (Cola rostrata) seed meal as an alternative energy feed source for growing African Giant Snail (Archachatina marginata). Journal of Molluscan Research. 5:43-50.

Edem Offiong (2012). Effect of Nutrition on the Hematology of Rabbits: A Review. Academia.edu

EFSA (2020). Health and welfare of rabbits farmed in different production systems. EFSA J., 18, 21–30.

Ezea J. (2004). Effects of graded levels of toasted Lina bean (Phaeous lunatus) meal in weaner rabbit diet. M.Sc Agric. Project. College of Animal Science and Health. Michael Okpara University of Agriculture, Umuahia.

FAO (2018). The Rabbits Husbandry, Health and Production.

Hassan, H.E., Elamin, K.M., Yousif, I.A., Musa, A.M. and Elkhairey, M.A. (2012). Evaluation of body weight and some morphometric traits at various ages in local rabbits of Sudan, Journal of *Animal Science Advances*, **2**(4): 407-415.

Lawrence J.D. (2006). *Expansion in the ethanol industry and its effect on the livestock industry.* IOWA State University of science and Technology.

Onebunne, A. (2013): *Rabbit Farming for Health and Wealth*. The Punch, 14th March, 2014.

Petracci M., Bianchi M. and Cavani C. (2009). Development of rabbit meat products fortified with n-3 polyunsaturated fatty acids. *Nutrients* **1,** 111–118.

SLUS-AK (1989).Soils and land use studies, Goverment print office, Uyo, Akwa Ibom State Soil Survey Staff 1994. Key to soil Taxonomy Soil Management Support Serviec (SMSS). Technology. No.19.pp306

Steel and Torrie (1980)

Szendro K, Szendro Z, Matics Z, Zotte AD, Odermatt M, Radnai I and Gerencser Z, (2015). Effect of genotype, housing system and hay supplementation on performance and ear lesions of growing rabbits. *Livestock Science,* 174, 105–112.

Taiwo A., Ogundipe I. and Ogunsiji O. (2002): *Reproductive and Growth Performance of rabbits Raised of Forage Crops:A Review*. In Proc. Of the 4th Annual Conference of the Animal Association of Nigeria held in Ibadan, Nigeria, Pp 108-109.

Trocino, A.; Filiou, E.; Tazzoli, M.; Bertotto, D.; Negrato, E.; Xiccato, G. (2014) Behaviour and welfare of growing rabbits housed in cages and pens*. Livest. Sci.,* 167, 305–314.

Trocino, A.; Cotozzolo, E.; Zomeño, C.; Petracci, M.; Xiccato, G.; Castellini, C. (2019). Rabbit production and science: The world and Italian scenarios from 1998 to 2018*. Ital. J. Anim. Sci*., 18, 1361–1371.

Trocino, A.; Filiou, E.; Zomeno, C.; Birolo, M.; Bertotto, D.; Xiccato, G. (2018**)**. Behaviour and reactivity of female and male rabbits housed in collective pens: Effects of floor type and stockinng density at different ages. *World Rabbit. Sci.*, 26, 135–147.

Tuyttens F., Maertens L., Van Poucke E., Van Nuffel A, Debeuckelaere S., Creve .J and Lens L., (2005). Measuring fluctuating asymmetry in fattening rabbits: a valid indicator of performance and housing quality? *Journal of Animal Science*, **83**, 2645–2652.

Vangeel I, Pasmans F, Vanrobaeys M, de Herdt P and Haesebrouck F, 2000. Prevalence of dermatophytes in asymptomatic guinea pigs and rabbits. *Veterinary Record,* **146**, 440–441.

Verger P., Ireland J., Møller A, Abravicius J., De Henauw S. and Naska A. (2002): Improvement of comparability of dietary intake assessment using currently available individual food consumption surveys. *European Journal of Clinical Nutrition;* **56**(2), S18 – S24.

**Whittington D., Nyachoti C., J.F. Patience, H. W. Gonyou1, R.T. Zijlstra1 and S.P. Lemay. (2003). Environmental and management strategies to achieve maximum performance through feed intake.**

Zerrouki, N., Hasnnachi, R., Lebas, F. and Berchiche, M. (2008). Productivity of rabbit does of a white population in Algeria. *Proceedings of the 9th World Rabbit Congress, June10-13, 2008 Verona, Italy.* Pp. 1643-1647.

Zomeno, C.; Birolo, M.; Gratta, F.; Zuffellato, A.; Xiccato, G.; Trocino, A. (2018).Effects of group housing system, pen foor type, and lactation management on performance and behaviour in rabbit does. Appl. Anim. Behav. Sci., 203, 55–63.