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WADASEN, MARK LLOYD P. Study on the Effects of Hot Red Pepper (*Capsicum annum)* Supplementation on the Growth Performance of Broilers. Benguet State Univesity, La Trinidad Benguet.

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ABSTRACT

This study was conducted to determine the growth performance of broilers supplemented with Hot Red Pepper (*Capsicum Annum*). It was conducted at Balili, La Trinidad Benguet. A total of 120 day old Cobb broiler chicks were used in this study. The treatments were: T_0- pure feeds (control); T_1- 0.5% of hot red pepper (500g/100kg of feeds);T_2- 1% of hot red pepper (1000g/100kg of feeds);T_3- 1.5% of hot red pepper (1500/100kg of feeds). The same care and management practices were given to all four treatments.

Results showed that there was no significant difference on initial weight, mean total feed consumed, and mortality rate among the different treatment. The treated group (T_1, T_2 and T_3) showed a significantly higher mean weekly gain in weight, mean total gain in weight, mean final weight, mean feed conversion efficiency and return of investment as compared to the control group (T_0).However the treated group were not significantly different from each other. No adverse side effects were observed from the use of hot red pepper as feed supplement to the experimental broilers.

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CHAPTER I

Introduction

Back Ground of the Study

Broiler production plays a major role in food security for the rapidly increasing Philippine human population. Their short production cycle, high feed efficiency and high biomass per unit of agricultural land are particularly attractive for the Philippine production system.

Chicken broiler and egg production are the most progressive animal enterprises in the Philippines today. The poultry industry in fact began as the backyard enterprise but has shifted to the formation of very large integrated contract farming operation (Broiler Production Guide, 2009).

Broiler is a term that defines a market category of poultry that can be apply to all species. Broilers are young chicken that are grown to 5 to 7 weeks of age, at which time they are marketed for human consumption.

Broiler meat is popular because it is cheaper, more versatile, and is perceived to give more health benefits than red meat. In spite of these advantages, the world broiler industry increasingly faces pressure to improve its production methods, with consumers and government citing health, environment, and animal welfare as the areas for improvement. Demand outlook is positive for the Philippine broiler industry because of

the continuing growth in population and household incomes in the country (PCCARD, 2006).

Hot red pepper (*Capsicum annum)* is one of the most important herbs, which is widely used in human feed all over the world, it originated from central and South America and it belonged to Solanaceae family. Genus *Capsicum* belongs to the most heavily and frequently consumed as spices throughout the world (Kobata *et al*., 1998).

Capsicum annum is introduced world wide which is divided into two categories: sweet (or mild) pepper and hot (or chili) pepper. *Capsicum annum* is the most spread in term of household consumption and industrial processing. Capsinoids is a family of compounds that are analogues of capsaicin, which is the pungent component in hot chilli peppers. Capsinoids are widely present at low levels in chili pepper fruit, it includes capsiate, dihydrocapsiate and it has a very favorable safety profile (Kobata *et al*., 1998)

Capsinoids present in red peppers causes pungent, hot tasting sensations when consumed as a part of the diet in addition to sensory properties that it may be affects human health, capsinoids includes antimicrobial activities against disease caused by bacteria. It exhibited protective effects against mutagens and carcinogens, cholesterol, obesity and pains (Suk-Hyun Choi *et al*., 2006).

The effect of hot red pepper appetizer on subsequent energy and micronutrient intakes were examined and it showed that hot red pepper in addition to appetizer significantly reduced the cumulative *ad lib* energy and carbohydrate intake .(Yoshioka *et al*., 1999).

Importance of the study

Poultry production in tropical condition provides a constant challenge. Heavy economic losses result from decreased productivity and increased mortality due to different causes like disease, improper management and stress. In connection to this many feed additives or feed supplements have been develop to boost the production performance of poultry. But some of the drawback of this is it causes antibiotic resistance due to the addition of antibiotics by some manufacturers and it is expensive. The main focus of this study is to find an alternative feed additive which is readily available in the community and would help to lower the production cause of poultry in backyard growers and commercial growers.

Objectives

The study was conducted to:

1. Determine the effects of hot red pepper supplementation on the growth performance of broilers.
2. Determine the best level of hot red pepper ratio as supplement to broilers.
3. Determine the economic return of using hot red pepper as an alternative feed additive.
4. Determine the Side effects of red hot chilli pepper supplements on broilers.

Place and Time of the Study

The experiment was conducted at Balili, La Trinidad, Benguet from October 28,2011 to December 11,2011.

CHAPTER II

Review of Related Literature

Due to the demands of poultry meat, farmers want their broilers to reach a maximum growth rate in the shortest possible time so they keep looking for ways to better improve the growth rate and the feed conversion of broilers. One possibly way of doing this is to add supplements on the diet of the broilers.

Increased restriction on the use of pharmaceutical antibiotics in feed as growth promoters is an accelerating trend towards the development of using alternative ingredients particularly those from plants which are perceived as "natural" and "safe" ingredients. Rosen (1996) defined the pronutrients as microfeedingstuff used orally in relatively small amounts to improve the intrinsic value of the nutrient mix in animal diet. They have many possible modes of action; antioxidation and metabolic enhancement, appetizer and guts environment modulation, in addition they can encourage efficient digestion. The mode of action may arise from plant metabolites belong to the classes of isoprene derivatives, flavonoids and glucosinolates and a large number of these compounds have been suggested to act as antibiotics or as antioxidants in vivo as well as in food (Wenk, 2003).

Plant active principles are chemical compounds present in the entire plant or in specific parts of the plant that confers them therapeutic activity or beneficial effects. These compounds are produced by the plants for defense against external factors, such as

physiological stress, environmental factors, and protection against predators and pathogens.

Botanical feed ingredients are substrates derived chemically from simple processes or collected intact from recognized parts of plants that are suitable for practical use in animal diet.

Red chilis contain high amounts of vitamin C and carotene (provitamin A). Yellow and especially green chilis (which are essentially unripe fruit) contain a considerably lower amount of both substances. In addition, peppers are a good source of most B vitamins, and vitamin B_6 in particular. They are very high in potassium, magnesium, and iron. Their high vitamin C content can also substantially increase the uptake of non-heme iron from other ingredients in a meal, such as beans and grains.

Capsaicin (CAP) is the main capsaicinod in chilli peppers. CAP is stable in water and some animal studies indicated that it absorbed into blood stream (Diepvens, 2007).

Capsaicin a pungent principle of hot red pepper, has been used as spices, feed additives and drugs in hot red pepper are capsaicin carotenoids e.g. capsanthin, capsorubin, carotene and steroidal saponins known as capsicidins found in seed and root (Saber, 1982) CAP is the main component of hot red pepper, including hot taste and is known to active afferent nerve fiber (Holzer, 1991), CAP has been shown to have a protective function in the gastric mucosa as the stimulation of afferent nerve endings by

capsaicin protects against aspirin or alcohol-induced gastric injury (Gonzalez *et al*., 1998).

Capsaicin (CAP, 8-methyl-N-Vanilly-6-nonenamide) is the active substance responsible for the irritating and pungent effects of various species of hot pepper. CAP has emerged as a relatively selective neurotoxin for small-diameter sensory neurons (Jessel *et al*., 1978; Nagy *et al*., 1981; Mitsuhiro *et al*., 1994; Jancso *et al*., 1997).

The role of CAP in carcinogenic processes is quite controversial. Although some investigators suspect that CAP is a carcinogen, co-carcinogen or tumor promoter, where as Young-Joon Surh (2002) have reported that it has a chemopreventive and chemotherapeutic effects. In addition to its action as preferentially repress for the growth of some transformed human and mouse cells (Morre *et al*., 1995).

CAP and main capsacinoid are also about twice as potent to taste and nerves as the minor capsaicinoids. Nordihyro capsaicin, hemodihydrocapsaicin and homocapsaicin skin, an alarm the residence of the stomach and to tonic a good digest.

Hot red pepper used as a spices and appetizers if it used in reasonable quantities because it defects the mucous membranes of the intestinal digestive. Hot red pepper is a tonic plant, has a calming activity, keeping the skin good, does not alarm the residence of the stomach and gives tonic a good digestion. Hot red pepper play an important role in increasing the ability analyzer and deposition of cholesterol and fat in the body and contributes to decrease levels of triglycerides and work to support the vascular system in the body (Hencken, 1991) explained that hot red pepper is rich in vitamin C which have a considerable impact on improving production through attributes the reduction of heat

stress on a fact that birds consumption of hot red pepper induce a considerable change in energy balance when individual are given free access to food (Yoshioka *et al*., 2001).

Plant extracts improved the digestibility of the feeds for broilers. The effect of different additives on digestibility improved the performance slightly but this effect was not statistically significant (Hernandez *et al*., 2004).

CHAPTER III

Materials and Methodology

Materials

The materials and equipments that were in the study are the following: 120 heads Cobb broiler chicks (Plate no.1), hot red pepper as the feed supplement (Plate no.2), Gold label feeds, brooding pen and rearing pen, weighing scale, vaccines, feeding troughs, waterers, newspapers, sacks, electric bulbs, sockets, improvised colored leg bands, marker, camera, record book and disinfectant(Plate no.3).

Plate no.1 Day-old Cobb broiler chicks.

Plate no.2 Hot red pepper (*Capsicum annum)* powder used in the study

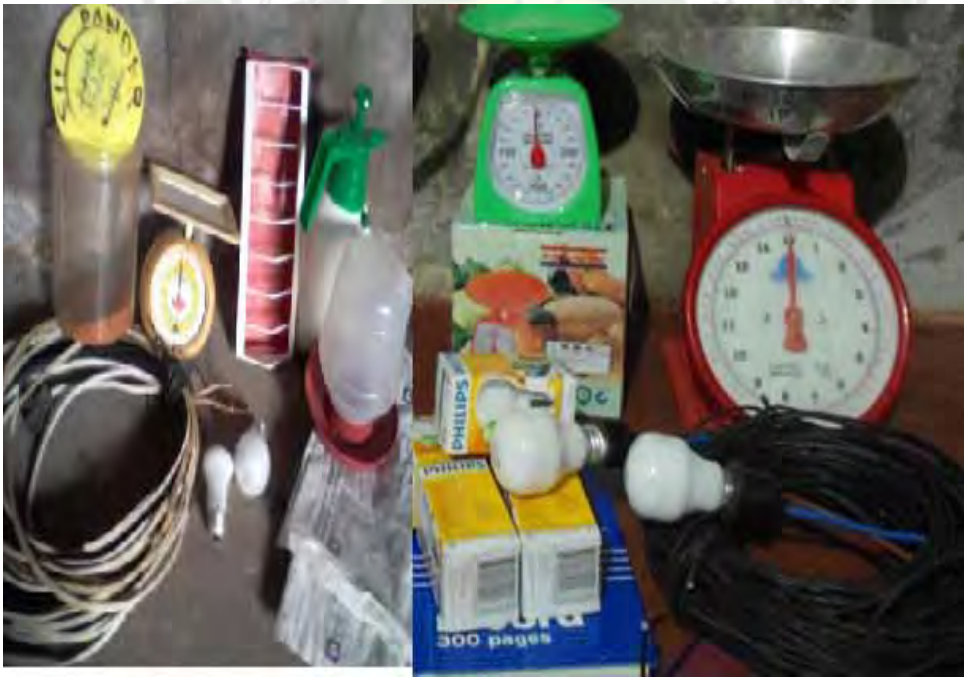

Plate no.3 Materials used in the study

Methodology

Pre-experimental Phase

At the start of the study, the brooding, rearing pens were prepared. (Plate no.4)The pens were divided equally into 12 compartments to represent the 3 replications of each treatment. The sides of the pens were covered with sacks to serve as protection for the broilers during sudden weather changes, to conserve heat during brooding time and to avoid tripping of birds on the floor during the period of experiment.

To maintain dryness of the brooding area news papers were layered on the flooring, this would also help to conserve the heat on the pens. The replicate pens were provided with 75-watt incandescent bulb this will provide warmth inside the pens. The replicate pens were properly label depending on the desired treatment to be given. Before the arrival of the chicks, the lights were switch on to ensure warmth within the brooding area.

Plate no.4 Brooding pens and rearing pens

Experimental Phase

Upon the arrival of the birds, they were weighed individually and randomly assign to the different treatments. The birds were identified using improvised colored leg bands to indicate the treatment, replication and the number of the chick. (Plate no.5) The treatments were replicated three times with ten birds per replicate. The leg bands were adjusted or replaced as the broilers grow(Plate no. 6).

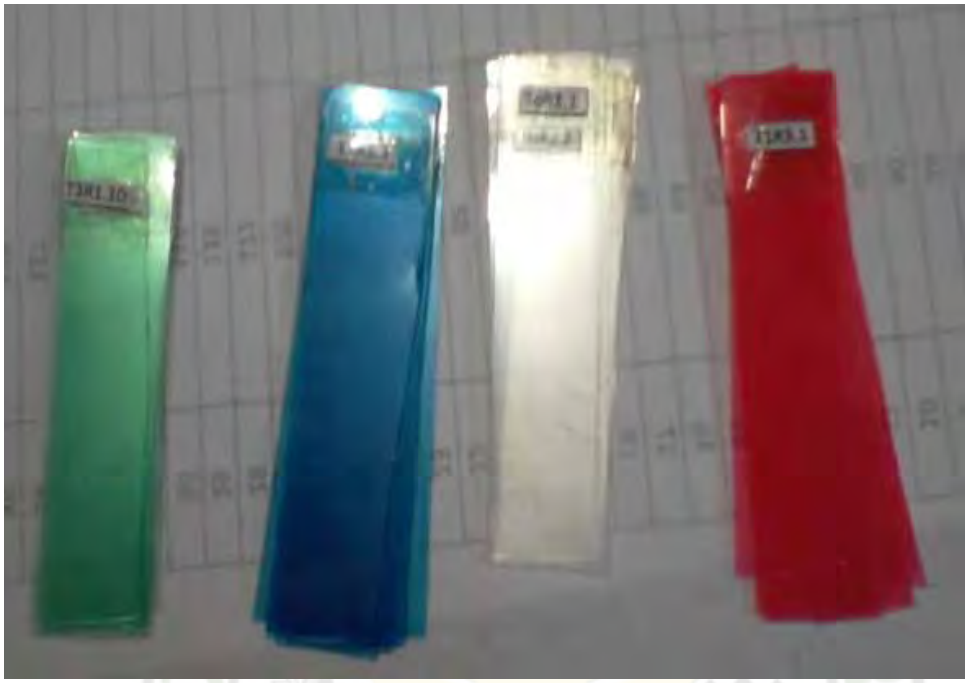

Plate no.5 Improvised colored leg bands for bird identification

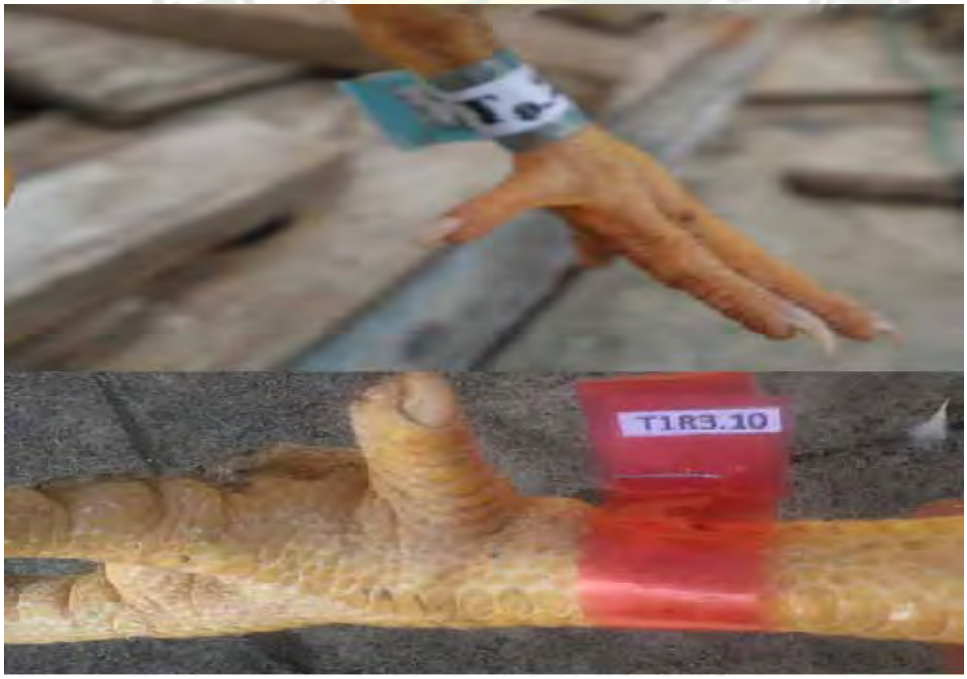

Plate no.6 Adjustment of the leg bands

The treatments were as follows:

T_0- pure feeds (control)

T_1- 0.5% of hot red pepper (500g/100kg of feeds)

T_2- 1% of hot red pepper (1000g/100kg of feeds)

T_3- 1.5% of hot red pepper (1500g/100kg of feeds)

The ratio of hot red pepper per kilograms of feeds was taken from the recommendation of Galib et al. (2011) who conducted the study entitled "The Effects of Using Hot Red Pepper as a Diet Supplement on Some Performance Traits in Broiler."

The chicks were brood for twenty-one days. The temperature inside the brooding pen was closely monitored using the response or behavior of the chicks as the gauge for temperature fluctuations. The chicks are vaccinated against NCD on the first week of brooding followed by second dose on the third week. As the chicks grow, the brooding pen and also the rearing pen size were adjusted to avoid overcrowding.

The chicks were fed with chick booster from day old to ten days of age which was gradually shifted to starter crumble from fourteen days to twenty-one days and were finally shifted to finisher crumble on the fifth week until the end of the study, shifting of feed types was done by mixing one-fourth of the new type of feed with three-fourth of the former type then increasing the new feed by one-fourth daily until it becomes the sole feed type for the birds. For the first three days, feeds were scattered on the floor for better access to the chicks, thereafter, feeding troughs was used. The feeding troughs and waterers were refilled as feeds and water are nearly to be consumed. The amount of feeds

and water given were measured per treatment and recorded prior to feeding to monitor the amount of feed given for the duration of study.

The following data were gathered

1. Mean initial weight of broiler chicks (g) - this was obtained by weighing the chicks individually at the start of the study.

2. Mean weekly gain in weight of broilers (g) - this was obtained by weighing the broilers individually at weekly intervals.

3. Mean total gain in weight (g) - this was obtained by subtracting the initial weight of the broilers from their final weight.

4. Mean final weight (g)- this was obtain by weighing the birds at the end of the study.

5. Mean feed consumption (g)- this was obtain by adding the total feed consumption of the broilers during the experimental period (day 1-day 45).

6. Mean feed conversion efficiency- this was obtained by dividing the mean total feed consumption with the mean total gain in weight of the broilers during the study.

7. Percentage mortality (%)- this was computed by dividing the total number of dead broilers per treatment divided by the total number of broilers per treatment then multiplying by one hundred.

8. Cost and return analysis- this was obtain by subtracting the total expenses that was incurred per treatment from the total sales per treatment to determine the net profit. The net profit was divided by the total expenses incurred per treatment to get the return on investment (ROI) per treatment.

A. total sales: this was obtained by the sale of the birds. Each bird was sold at Php. 110 per kilo.

B. Total cost: includes the following:

1. Cost of birds- the birds were bought at Php. 38 per head.

2. Cost of supplement - this was taken by multiplying the total amount of the supplement that was consumed in each treatment with the corresponding price of the treatment.

3. Cost of feeds per treatment- this was taken by multiplying the total amount of feeds that was consumed in each treatment with the corresponding price of feeds.

4. Cost of electricity- this was computed by multiplying the wattage of the bulbs used by the number of bulbs used and number of hours the bulbs are used. The products was divided by 100 to get the total kilowatts used then the quotient multiplied by the price per kilowatt.

5. Cost of disinfectant- this was bought at Php. 60. The amount was divided among the four treatments.

6. Newspapers-newspapers were bought at Php 15 per kilo. Approximately seven (7) kilos of newspapers were used during the brooding period as litter materials. The amount was divided equally among the four treatments.

7. Vaccine- The cost of NCD vaccine was Php 150. The amount was divided equally among the four treatments.

8. Bulb- bulbs were 50 each. A total of 12 bulbs were used during the brooding period.

9. Labor cost- this was taken by dividing the cost of labor with eight hours and multiplying the number of hours used in caring and management of the birds and multiplying again to the number of days of the study. Labor cost was pegged at Php. 250 per day; approximately two hours per day was used for the feeding and caring of the experimental birds.

10. Rentals

a. Weighing scale rental- this was pegged at Php. 45. The amount was divided equally among the four treatments.

b.Housing- this was obtained by dividing the cost of housing materials. The quotient was further divided by 12 to get the monthly depreciation cost. The depreciation costs of 1.5 months were computed for the duration of the study divided equally among the four treatments.

c. Feeders- a total of 12 plastic feeders were rented at Php. 5 each for the entire duration of the study. The amount was equally divided among the four treatments.

d. Waterers- a total of 12 plastic waters were rented at Php. 5 each for the entire duration of the study. The amount was equally divided among the four treatments.

Sanitation was maintained inside the experimental house throughout the study. Weighing of the birds and recording was done every Saturday before the birds feeding

CHAPTER IV

Results and Discussions

Mean Initial Weight of the Chicks

Table 1. shows the mean initial weight of the chicks in grams.

Table 1: Mean Initial Weight of the Chicks(g)

TREATMENT	MEAN
T_0	50.500[a]
T_1	49.333[a]
T_2	47.667[a]
T_3	46.667[a]

* means with the same letters are not significantly different

The initial weight of birds was shown in table 1. The table shows that T_0 had the highest initial mean weight of 50.500 grams, followed by T_1 with 49.333 grams then T_2 with 47.667 grams and T_3 with 46.667 grams.

However, statistical analysis revealed that there was no significant difference among the initial weight of chicks across the different treatments. This means that the initial weight of chicks were homogenous at the start of the study.

In the study conducted by Sabas (2005) titled “Performance of Meat Breeds of Chicken Raised Under Semi-ranged System” showed that the mean initial weight of the

day-old sasso chicks was 52 grams, kabir chicks was 54 grams, white broiler chicks was 82 grams, and local native chicks was 27 grams. Thus, mean initial weight of the experimental birds which was 47.875 grams was lower than the other meat breeds except for the local native chicks.

Mean Weekly Gain in Weight

Table 2. shows the mean weekly gain in weight of the broilers in grams for six weeks rearing period.

Table 2. Mean Weekly Gain in Weight of the broilers (g)

TREATMENT	WEEKLY MEAN					
	1st week	2nd week	3rd week	4th week	5th week	6th week
T_0	156.833[a]	395.833[b]	717.13[b]	1028.43[a]	1519.83[b]	1827.00[b]
T_1	154.500[a]	405.667[ab]	757.65[a]	1060.53[a]	1590.00[ab]	1926.67[a]
T_2	160.500[a]	417.167[a]	788.179[a]	1031.53[a]	1510.00[b]	1936.67[a]
T_3	157.333[a]	403.000[ab]	770.00[a]	1032.87[a]	1626.67[a]	1973.33[a]

* means with the same letters are not significantly different

Table 2 shows that in the first week there were no significant difference among the treatments in the mean gain in weight. On the second week, T_2 showed the higher gain in weight as compared to T_0 but not significantly different to $T_1$and T_3 but significantly higher than T_0. T_1 and T_3 were not also significantly different to T_0. On the third week T_1, T_2 and T_3 had a significantly higher gain in weight as compared to the control group (T_0). However there was no significant different in gain in weight among the treated group. On the fourth week the treatments showed no significant difference in term of weekly gain in weight. On the fifth week T_3 showed a significantly higher gain in weight as compared to T_0 and T_2, but not significantly different to T_1. T_0, T_1 and T_2 were not significantly

different in mean gain in weight on the fifth week. On the sixth week results showed that the treated group had a significantly higher gain in weight as compared to the control group. No significant difference was observed among the treated group in terms of mean gain in weight on the sixth week.

Result shows that during the duration of the study there were variations on the weekly gain in weight of the broilers. However on the final week it showed that treatments with supplement (T_1, T_2 and T_3) had a higher weekly gain in weight as compared to the control group (T_0).

The result of the study conducted by Eldeeb, Metwally and Galal (2006) entitled "The Impact of Botanical Extract, Capsicum (*capsicum annum),* Oil supplementation and their interactions on the productive performance of broiler chicks", showed that improved body weight and overall average daily gain due to interaction effect among dietary treatments. Feeding capsicum in presence of 5% oil significantly improved feed conversion ratio.

Also on the study conducted by Garcia et al.(2007) showed that mixtures of plant extracts containing carvacrol, cynnamalde-hyde and capsaicin improved the performance of broiler chicken.

Mean Final Weight of the Broilers (g)

Table 3. shows the mean final weight of the broilers from the first week up to the sixth week of brooding and rearing.

Table 3: Mean Final Weight of the Broilers (g)

TREATMENT	MEAN
T_0	1827.00^b
T_1	1926.67^a
T_2	1936.67^a
T_3	1973.33^a

* means with the same letters are not significantly different

Statistical analysis showed that there was no significant difference among T_1, T_2 and T_3 on the mean final weight of the birds, but results show that the treated groups (T_1, T2, and T_3) had significantly higher final weight compared to T_0.

Azouze (2001) who conducted the study on the "Effect of hot pepper and fenugreek seed supplementation on broiler diets" concluded that hot pepper improved body weight gain and feed conversion after its addition to broiler diets.

Also Hermandez et al. (2004) found that capsaicin increased the enzyme secretion in the digestive tract, thereby enhanced digestion and increased the nutrient availability. Improved growth performance of the broilers fed with 5% Chilli powder suggests that capsaicin alone also enhances the performance of broilers.

Mean Total Gain in Weight of the Broilers(g)

Table 4. shows the mean total gain in weight of the birds from the first week up to the sixth week of brooding and rearing.

Table 4: Mean Total Gain in Weight of the Broilers(g)

TREATMENT	MEAN
T_0	1776.50^b
T_1	1877.33^a
T_2	1889.00^a
T_3	1926.67^a

* means with the same letters are not significantly different

Statistical analysis showed that there was no significant difference among T_1, T_2 and T_3 on the mean total gain in weight of the broilers, but the three treatments had a significantly higher total gain in weight as compared to T_0.

Pruthi (2003) stated on his study that capsaicin had a growth promotant effect. He added that dried pods of *Capsicum annum* or chilli contain 1.8% capsaicin and thus are good sources of natural capsaicin.

Though Chili powder is normally used as spices in human foods, it's a nutrient rich feed ingredient. Chilli contains 10.5 % CP, 5.8 % lipids, 1.6% total phosphorus, 1.9% potassium, 0.47% lysine, 0.12% methionine and 3240 Kcal of gross energy /kg. Therefore, apart from growth promoting effects, dietary Chili powder could be regarded as a source of other nutrients too. (Pruthi 2003)

Mean Total Feed Consumption (g)

Table 5. shows the mean feed consumption of the broilers.

Table 5. Mean Feed Consumption (g)

TREATMENT	MEAN
T_0	39190[a]
T_1	39190[a]
T_2	39190[a]
T_3	39190[a]

* means with the same letters are not significantly different

The table shows that there was no significant difference on the mean feed consumption of all treatments. Since the broilers were not fed ad libitum. The amount of daily feed consumption per bird was computed based on the feeding guide from Foster Feeds Inc.

The table showed the same result in all treatments because the amount of feed given was based on the recommended feeding guide from Foster Feeds Inc. and there were no mortality incurred during the duration of the study. The feeding guide can be seen in appendix table 13.

Mean Feed Conversion Efficiency (kg)

Table 6. shows the feed conversion efficiency of the birds in the different treatments.

Table 6. Mean Feed Conversion Efficiency (kg)

TREATMENT	MEAN
T_0	2.20333[a]
T_1	2.09000[b]
T_2	2.07333[b]
T_3	2.03333[b]

* means with the same letters are not significantly different

The feed conversion efficiency indicates the amount of feeds needed to produce one kilogram live weight of the birds. Statistical analysis shows that T_3 had the most efficient feed conversion but not significantly different from that of T_2 and T_1. T_0 had significantly lower feed conversion efficiency as compared to the treated groups.

On the study conducted by Hernandez et al. (2004), entitled "Influence of two plant extracts on broilers performance, digestibility and digestive organ size." showed that plant extracts improved the digestibility of the feeds for broilers. The effect of different additives on digestibility improved the performance slightly but this effect was not statistically significant.

Capsaicin increased the enzyme secretion in the digestive tract, thereby enhanced digestion and increased the nutrient availability (Hermandez et al.2004).

The positive effect of hot pepper may be due to its stimulant, carminative digestion and antimicrobial properties and also the presence of vit. C, E and provitamin A (El-Aidy, 1981).

Percentage Mortality of the Broilers (%)

Table 7. shows the percentage mortality of birds in the different treatments.

Table 7. Percentage Mortality of the Broilers (%)

TREATMENT	MEAN
T_0	0
T_1	0
T_2	0
T_3	0

* means with the same letters are not significantly different

Table 7 showed that there was no mortality that occurred during the duration of the study.

According to Foster Food Incorporated as cited by Wandit (2006), acceptable percentage mortality among its contract broiler growers was 10 percent.

Chickens are stressed by various factors such as transportation to the growing site, overcrowding, vaccination, chilling and/or overheating. These tend to create an imbalance in intestinal microflora and lowers of body defense mechanisms (Quilang 2011).

Cost and Return Analysis

Table 8. shows the cost and return analysis of the different treatments.

Table 8. Cost and Return Analysis

TREATMENT	PARTICULARS			
	Total sales	Total Cost	Net income	Mean ROI(%)
T_0	6029.1	5705.595	326.505	5.726[b]
T_1	6358	5761.38	596.62	10.356[a]
T_2	6391	5820.165	570.535	9.803[a]
T_3	6512	5878.935	633.065	10.768[a]

* means with the same letters are not significantly different

Result shows that there was a positive net income for all the treatments. T_1, T_2 and T_3 had no significant difference in the ROI, however the treated group had a significantly higher return of investment compared to T_0. The particulars of cost and return analysis can be seen on appendix table 13.

The study showed that T_3 had the highest total sale because it had a higher total gain in weight and a better feed conversion efficiency (see Table 6), which means higher final weight that resulted to higher net income as compared to the other treatments. However, the higher total cost incurred in T3 had reduced the net income gained hence the ROI for the treated group was not significantly different from each other. However, the ROI of the treated group was significantly higher compared to the control group.

The ROI revealed that for every 1 peso investment on T_3, there is an earned income of almost 11 centavos, T_2 will earn an income of almost 10 centavos, T_1 with an income of almost 10 centavos and T_0 with 6 centavos. It appears that the use of hot red pepper as feed supplement to broilers had a significant positive economic gain.

Side Effects

There were no adverse side effects observed from the use of hot red pepper as feed supplement to the experimental broilers.

Hot red pepper has a carminative digestion and antimicrobial properties and also the presence of vitamins which improves growth of broilers as stated by El-Aidy.(1981).

Birds do not detect capsaicin. Although birds possess the TRVP1 (receptor for capsaicin) receptor in their nerve cells, it is not activated by capsaicin as it is in mammals. No toxicity information or field studies involving birds were found for capsaicin (Capsitech 2011).

CHAPTER V

Summary, Conclusion and Recommendation

The study was conducted at Balili, La Trinidad, Benguet from October 28, 2011 to December 11, 2011, to determine the effects of hot red pepper supplementation on the growth performance of broilers, determine the best feed-hot red pepper ratio as supplement to broilers, the economic return of using hot red pepper as an alternative feed additive, and the side effects of red hot chilli pepper on broilers.

One hundred twenty day-old cob broiler chicks were randomly distributed into four treatments. Each treatment was replicated three times with ten birds per replicate. The treatments were: T_0- pure feeds (control); T_1- 0.5% of hot red pepper (500g/100kg of feeds); T_2- 1% of hot red pepper (1000g/100kg of feeds); T_3- 1.5% of hot red pepper (1500/100kg of feeds). The same care and management practices were given to all four treatments.

The birds were randomly assigned into the different treatments and improvised colored leg bands were used to identify the birds. The birds were fed based on the recommended feeding guide of Foster Food Inc. with commercial Gold Label feeds. The birds were confined throughout the duration of the study and were supplemented with the different levels of Hot Red Pepper.

Results showed that there was no significant difference on initial weight, mean total feed consumed, and mortality rate among the different treatments. The weekly gain in weight, total gain in weight, final weight, feed conversion efficiency, and return of

investment, results showed that there was a significantly higher result among the treated group (T_1, T_2 and T_3) as compared to the control group (T_0). However the treated group (T_1, T_2 and $T_{3)}$ were not significantly different from each other. No adverse side effects were observed from the use of hot red pepper as feed supplement to the experimental broilers.

Based on the results of the study, the use of Hot Red Pepper as a supplement to improve the growth performance of boiler is recommended. Based on the result of the study T_3 which has the ratio of 15grams of hot red pepper per kilograms of feeds gave the best result.

The author further recommends using the same supplement at different levels in other poultry enterprise such as in layer and also in other livestock industries to determine and evaluate its effect on their growth performance. Furthermore, the use of different commercial feeds, locally available plant supplements can also be studied as to their effect on the growth performance of the broiler chicks.

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LIST OF APPENDICES

APPENDIX A

TABLES AND STATISTICAL ANALYSIS

Table No.1 Mean Initial Weight of Chicks (g)

TREATMENT	REPLICATE			TOTAL	MEAN
	1	2	3		
T_0	53.5	45.5	47.5	146.5	50.500[a]
T_1	51	51	46	148	49.333[a]
T_2	50.5	44.5	48	143	47.667[a]
T_3	43.5	48.5	48	140	46.667[a]
Grand Total and Grand Mean				577 .5	48.542

* means with the same letters are not significantly different

The ANOVA Procedure

Dependent Variable: Mean Initial Weight of Chicks (g)

Source	DF	Sum of squares	Mean Square	F Value	Pr > F
Model	3	26.22916667	8.74305556	1.03	0.4300
Treatment	3	26.22916667	8.74305556	1.03	0.4300
Error	8	68.00000000	8.50000000		
Corrected Total	11	94.22916667			

R-Square	Coeff Var	Root MSE	Initial Weight Mean
0.278355	6.006131	2.915476	48.54167

Table No.2 Mean Gain in Weight of the Broilers in Week 1 (g)

TREATMENT	REPLICATE			TOTAL	MEAN
	1	2	3		
T_0	160	158	152.5	470.5	156.833[a]
T_1	155.5	157.5	150.5	463.5	154.500[a]
T_2	161.5	159	161	481.5	160.500[a]
T_3	150	164	157.5	472	157.333[a]
Grand Total and Grand Mean				1887.5	157.291

* means with the same letters are not significantly different

The ANOVA Procedure

Dependent Variable: Mean Gain in Weight of the Broilers in Week 1

Source	DF	Sum of squares	Mean Square	F Value	Pr > F
Model	3	54.8958333	18.2986111	0.97	0.4528
Treatment	3	54.89583333	18.29861111	0.97	0.4528
Error	8	150.8333333	18.8541667		
Corrected Total	11	205.7291667			

R-Square	Coeff Var	Root MSE	WK1 Mean
0.266835	2.760565	4.342138	157.2917

Table No.3 Mean Gain in Weight of the Broilers in Week 2 (g)

TREATMENT	REPLICATE			TOTAL	MEAN
	1	2	3		
T_0	403	395	389	1187.5	395.833[b]
T_1	407.5	407.5	402	1217	405.667[ab]
T_2	429	407.5	415	1251.5	417.167[a]
T_3	393	414.5	401.5	1209	403.000[ab]
Grand Total and Grand Mean				4865	405.4167

* means with the same letters are not significantly different

The ANOVA Procedure

Dependent Variable: Mean Gain in Weight of the Broilers in Week 2

Source	DF	Sum of squares	Mean Square	F Value	Pr > F
Model	3	707.4166667	235.8055556	3.22	0.0824
Treatment	3	707.416667	235.805556	3.22	0.0824
Error	8	585.000000	73.125000		
Corrected Total	11	1292.416667			

R-Square	Coeff Var	Root MSE	WK2 Mean
0.547360	2.109266	8.551316	405.4167

Table No.4 Mean Gain in Weight of the Broilers in Week 3 (g)

TREATMENT	REPLICATE			TOTAL	MEAN
	1	2	3		
T_0	725.4	734	692	2151.4	717.13[b]
T_1	762.5	760.5	750	2273	757.65[a]
T_2	797	770	797.5	2364.5	788.179[a]
T_3	747	791	772	2310	770.00[a]
Grand Total and Grand Mean				9098.9	758.241

* means with the same letters are not significantly different

The ANOVA Procedure

Dependent Variable: Mean Gain in Weight of the Broilers in Week 3

Source	DF	Sum of squares	Mean Square	F Value	Pr > F
Model	3	8171.969167	2723.989722	8.57	0.0070
Treatment	3	8171.96917	2723.98972	8.57	0.0070
Error	8	2543.84000	317.98000		
Corrected Total	11	10715.80917			

R-Square	Coeff Var	Root MSE	WK3 Mean
0.762609	2.351756	17.83199	758.2417

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Table No.5 Mean Gain in Weight of the Broilers in Week 4 (g)

TREATMENT	REPLICATE			TOTAL	MEAN
	1	2	3		
T_0	1049.5	1039.2	996.6	3085.3	1028.43[a]
T_1	1046.9	1081.5	1053.2	3181.6	1060.53[a]
T_2	1041	1043	1010.6	3094.6	1031.53[a]
T_3	1032.6	1042	1024	3098.6	1032.87[a]
Grand Total and Grand Mean				12460.1	1038.342

* means with the same letters are not significantly different

The ANOVA Procedure

Dependent Variable: Mean Gain in Weight of the Broilers in Week 4

Source	DF	Sum of squares	Mean Square	F Value	Pr > F
Model	3	2000.922500	666.974167	1.74	0.2368
Treatment	3	2000.922500	666.974167	1.74	0.2368
Error	8	3073.746667	384.218333		
Corrected Total	11	5074.669167			

R-Square	Coeff Var	Root MSE	WK4 Mean
0.394296	1.887769	19.60149	1038.342

Table No.6 Mean Gain in Weight of the Broilers in Week 5 (g)

TREATMENT	REPLICATE			TOTAL	MEAN
	1	2	3		
T_0	1594.5	1505	1460	4559.5	1519.83[b]
T_1	1585	1645	1540	4770	1590.00[ab]
T_2	1490	1470	1570	4530	1510.00[b]
T_3	1590	1645	1645	4880	1626.67[a]
Grand Total and Grand Mean				18739.5	1561.625

* means with the same letters are not significantly different

The ANOVA Procedure

Dependent Variable: Mean Gain in Weight of the Broilers in Week 5

Source	DF	Sum of squares	Mean Square	F Value	Pr > F
Model	3	28341.72917	9447.24306	3.35	0.0760
Treatment	3	28341.72917	9447.24306	3.35	0.0760
Error	8	22541.83333	2817.72917		
Corrected Total	11	50883.56250			

R-Square	Coeff Var	Root MSE	WK5 Mean
0.556992	3.399170	53.08229	1561.625

Table No.7 Mean Gain in Weight of the Broilers in Week 6 (g)

TREATMENT	REPLICATE			TOTAL	MEAN
	1	2	3		
T_0	1856	1800	1825	5481	1827.00[b]
T_1	1955	1945	1880	5780	1926.67[a]
T_2	1920	1925	1965	5810	1936.67[a]
T_3	1985	1965	1970	5920	1973.33[a]
Grand Total and Grand Mean				22991	1915.917

* means with the same letters are not significantly different

The ANOVA Procedure

Dependent Variable: Mean Gain in Weight of the Broilers in Week 6

Source	DF	Sum of squares	Mean Square	F Value	Pr > F
Model	3	35246.91667	11748.97222	14.86	0.0012
Treatment	3	35246.91667	11748.97222	14.86	0.0012
Error	8	6324.00000	790.50000		
Corrected Total	11	41570.91667			

R-Square	Coeff Var	Root MSE	WK6 Mean
0.847874	1.467487	28.11583	1915.917

Table No.8 Mean total Gain in Weight of the Broilers (g)

TREATMENT	REPLICATE			TOTAL	MEAN
	1	2	3		
T_0	1802.5	1749.5	1777.5	5329.5	1776.50[b]
T_1	1904	1894	1834	5632	1877.33[a]
T_2	1869.5	1880.5	1917	5667	1889.00[a]
T_3	1941.5	1916.5	1922	5780	1926.67[a]
Grand Total and Grand Mean				22408.5	1867.375

* means with the same letters are not significantly different

The ANOVA Procedure

Dependent Variable: Mean total Gain in Weight of the Broilers

Source	DF	Sum of squares	Mean Square	F Value	Pr > F
Model	3	37021.72917	12340.57639	16.86	0.0008
Treatment	3	37021.72917	12340.57639	16.86	0.0008
Error	8	5854.33333	731.79167		
Corrected Total	11	42876.06250			

R-Square	Coeff Var	Root MSE	Gain Mean
0.863459	1.448646	27.05165	1867.375

Table 9. Mean Feed Consumption of the Broilers (g)

TREATMENT	MEAN
T_0	39190[a]
T_1	39190[a]
T_2	39190[a]
T_3	39190[a]

* means with the same letters are not significantly different

Table 10. Mean Feed Conversion Efficiency of the Broilers (kg)

TREATMENT	MEAN
T_0	2.20333[a]
T_1	2.09000[b]
T_2	2.07333[b]
T_3	2.03333[b]

* means with the same letters are not significantly different

The ANOVA Procedure

Dependent Variable: Mean Feed Conversion Efficiency of the Broilers

Source	DF	Sum of squares	Mean Square	F Value	Pr > F
Model	3	0.04780000	0.01593333	15.17	0.0012
Treatment	3	0.04780000	0.01593333	15.17	0.0012
Error	8	0.00840000	0.00105000		
Corrected Total	11	0.05620000			

R-Square	Coeff Var	Root MSE	Y Mean
0.850534	1.543033	0.032404	2.100000

Table No.11 Percentage Mortality

TREATMENT	REPLICATE			TOTAL	MEAN
	1	2	3		
T_0	0	0	0	0	0^a
T_1	0	0	0	0	0^a
T_2	0	0	0	0	0^a
T_3	0	0	0	0	0^a
Grand Total and Grand Mean				0	0

* means with the same letters are not significantly different

Table No.12 Mean ROI(%)

TREATMENT	REPLICATE			TOTAL	MEAN
	1	2	3		
T_0	7.403735	4.163105	5.609814	17.17665	5.726[b]
T_1	11.97838	11.4056	7.682534	31.06652	10.356[a]
T_2	8.862893	9.14639	11.3989	29.40819	9.803[a]
T_3	11.42324	10.30059	10.58125	32.30509	10.768[a]
Grand Total and Grand Mean				109.9564	9.163037

* means with the same letters are not significantly different

The ANOVA Procedure

Dependent Variable: Mean ROI of the Broilers

Source	DF	Sum of squares	Mean Square	F Value	Pr > F
Model	3	48.67368722	16.22456241	6.27	0.0170
Treatment	3	48.67368722	16.22456241	6.27	0.0170
Error	8	20.69666478	2.58708310		
Corrected Total	11	69.37035200			

R-Square	Coeff Var	Root MSE	ROI Mean
0.701650	17.55358	1.608441	9.163037

Table 13: Cost and Return Analysis

PARTICULARS	T_0	T_1	T_2	T_3
TOTAL SALES	6029.1	6358	6390.7	6512
TOTAL COSTS	5702.595	5761.38	5820.165	5878.935
Chicks	1140	1140	1140	1140
feeds	3111.96	3111.96	3111.96	3111.96
labor	703.125	703.125	703.125	703.125
vaccines	37.5	35.5	37.5	37.5
electricity	375	375	375	375
bulb	90	90	90	90
supplement	0	58.785	117.57	176.34
newspaper	26.25	26.25	26.25	26.25
disinfectant	15	15	15	15
housing	162.51	162.51	162.51	162.51
waterer	15	15	15	15
Weighing	15	15	15	15
scale	11.25	11.25	11.25	11.25
Net Return	326.505	596.62	570.535	633.065
Mean ROI(%)	5.726	10.356	9.803	10.768

Table 14. Foster Food Inc. feeding guide

Days	Daily Feed Consumed (grams)	Body Weight (grams)
1	13	45
2	15	57
3	18	71
4	21	87
5	24	105
6	27	125
7	30	147
8	33	171
9	36	197
10	40	226
11	44	258
12	48	292
13	52	328
14	56	365
15	60	403
16	64	442
17	68	482
18	72	523
19	76	565
20	80	608
21	84	652
22	88	697
23	92	743
24	96	790
25	100	838
26	104	887
27	108	937
28	112	988
29	115	1040
30	118	1093
31	121	1147
32	123	1202
33	125	1258
34	127	1315
35	129	1373
36	131	1432
37	133	1492
38	135	1553

39	137	1615
40	139	1678
41	141	1742
42	143	1807
43	145	1873
44	147	1940
45	149	2008

APPENDIX B

Saint Louis University
College of Natural Sciences
NATURAL SCIENCES RESEARCH UNIT (NSRU)

Phytochemical Analysis Results

Date: March 13, 2012
Name of Sample : *Chili (dried fruits)*

Extraction technique: sample is macerated in 85% methanol for 48 hours.

Preliminary Tests	Result	Constituent/s
A. Lead acetate test	+++	gums, mucilages, glycosides
B. Fehling's test	+++	carbohydrates, reducing sugars
C. Ferric chloride test	++	tannin and tannin derivatives
D. Millon's test	++	proteins and its derivatives
Tests for Physiologically Active Constituents		
1. Alkaloids		
1.1 Dragendorff's test	+	alkaloids
1.2 Mayer's test	+	alkaloids
2. Steroids		
2.1 Keller-Killiani	-	deoxysugars
2.2 Lieberman-Buchard	+	unsaturated sterols
2.3 Kedde test	-	unsaturated lactones
3. Anthraquinones		
3.1 Borntrager's test	-	anthraquinones
3.2 Modified Borntrager's test	-	anthraquinones
4. Flavonoids		
4.1 Bate and Metcalf	-	leucoanthocyanins and cyanidin
4.2 Wilstatter "cyanidin"	-	γ-benzopyrene nucleus
5. Saponins		
5.1 Froth test	-	saponins
5.2 Leibermann-Buchard	+	unsaturated sterols and triterpenes
6. Tannins and Polyphenols		
6.1 Gelatin test	-	tannins
6.2 Ferric chloride test	+	polyphenolic compounds
7. Cyanogenic glycoside		
7.1 Guignard test	-	cyanogenic glycosides

* (+): Present; (-): Absent; (+, ++, +++): Degree of abundance - for preliminary tests only

* **Disclaimer**: The result of analysis relates to the sample received by the laboratory and is representative only of that sample.

Analyzed by:
JENNER M. BUTLONG, RPh.
NSRU Lab. Analyst

Approved by:
EVELYN E. ODA, PhD.
Officer-in-charge, NSRU

N S R U
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E-mail: **cnsru@slu.edu.ph**

APPENDIX C

Benguet State University
COLLEGE OF VETERINARY MEDICINE
La Trinidad, Benguet

APPLICATION FOR FINAL ORAL DEFENSE

Name of Student: **MARK LLOYD P. WADASEN**

Student #: **0580102**

Thesis Title: **STUDY ON THE EFFECTS OF HOT RED PEPPER (*Capsicum annum)* SUPPLEMENTATION ON THE GROWTH PERFORMANCE OF BROILERS.**

Date of Defense: March 14, 2012

Time and Place of Defense: 1:00-5:00 pm; Audio Visual Room (AVR)

Panels:

	Signature
ANATALIA V. CASTRENCE, DVM	_____
KAREN B. GAERLAN, DVM	_____
LORETTA C. ROMERO, DVM	_____

Noted by:

RICHARD P. DUMAPIS, DVM _____
Adviser

JOSEPH A. DIANSO, DVM _____
Dean

Benguet State University
COLLEGE OF VETERINARY MEDICINE
La Trinidad, Benguet

REPORT ON RESULTS OF FINAL ORAL DEFENSE

Name of Student: **MARK LLOYD P. WADASEN**

Student #: **0580102**

Thesis Title: **STUDY ON THE EFFECTS OF HOT RED PEPPER (*Capsicum annum)* SUPPLEMENTATION ON THE GROWTH PERFORMANCE OF BROILERS.**

Date and time of Examination: _____

Place of Examination: _____

MEMBERS OF EXAMINING COMMITTEE

Name of members:

	Signature	Remarks
ANATALIA V. CASTRENCE, DVM	_____	_____
KAREN B. GAERLAN, DVM	_____	_____
LORETTA C. ROMERO, DVM	_____	_____
		Passed/Failed

Approved by:

JOSEPH A. DIANSO, DVM
Dean

BENGUET STATE UNIVERSITY
INSTRUCTION
EXTENSION
RESEARCH
PRODUCTION
1916

BIOGRAPHICAL SKETCH

NAME: **MARK LLOYD PIAGA WADASEN**

BIRTHDAY: June 19, 1989

PLACE OF BIRTH: Cotcot, Bangao, Buguias, Benguet

ADDRESS: IC 132 Betag, La Trinidad, Benguet

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CONTACT NUMBER: 09483686030

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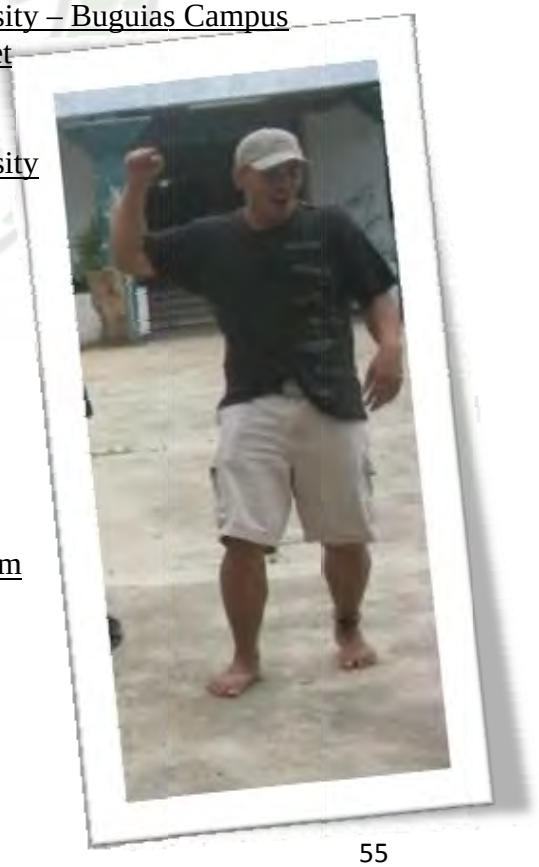
ELEMENTARY
- NAME OF SCHOOL: Cotcot, Talabis,Elementary School
- ADDRESS: Cotcot, Bangao, Buguias, Benguet
- YEAR GRADUATED: 2001

SECONDARY
- NAME OF SCHOOL: Benguet State University – Buguias Campus
- ADDRESS: Loo, Buguias, Benguet
- YEAR GRADUATED: 2005

COLLEGE
- NAME OF SCHOOL: Benguet State University
- ADDRESS: La Trinidad, Benguet
- DEGREE AND YEAR OF GRADUATION: DVM 2012



AFFILIATIONS:

BSU - Veterinary Medicine Student Government

Rodeo Club Philippines - BSU chapter

BSU - Highland Cowboys and Cowgirls Rodeo Team

BSU- Basketball Team (men)