FEED PREFERENCE OF CHICKEN *Gallus gallus domesticus* DUE TO OLFACTORY SENSE

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APPROVAL SHEET

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FEED PREFFERENCE OF CHICKEN (*Galusgalusdomestics*) DUE TO OLFACTORY SENSE

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Feed Preference of Chicken *Gallus gallus domesticus* due to Olfactory Sense

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ABSTRACT

Chickens are essential in food supply and understanding some of their factors like feed preference can lead to improvement in the production. This study focuses on the effects of scents in the feed preference of the chicken *Gallus gallus domesticus*. As test specimen, 15 chicks were bought and placed in cages containing four feeders with feeds with unscented (control), banana, carabao grass, and corn scents. They were fed for three weeks. A five-minute test was conducted every weekend. The net weights of the feeds in the test were gathered. From week one to week three the net weights of feeds consumed by the chicks decreased, from 142g to 70g in the unscented feed, 145g to 35g in the banana-scented feed, 135g to 27g in the carabao grass-scented feed, and 165g to 11.5g in the corn-scented feed. The data was analyzed using two-way Analysis of Variance. The data presents sufficient evidence that net weight of feed consumed by chickens depends on the time of feeding (i.e., weekly). This is indicated by an F value of 35.13 with a highly significant probability value of 0.000010. There was a significant difference between the net weight feed of the control and the scented feeds although there's a little significant difference between the scented feeds (α= 0.05). The scents and day of feeding has interaction in affecting the amount of feeds consumed by the chicks.Based on the results it was concluded that chickens prefer feeds with scents than the unscented one although it is not certain which among the scents is the most preferred.

Keywords: chickens, feeds, net weight, preference, scents

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1
INTRODUCTION

A. Background of the Study

Chickens are domestic birds that are consumed every day as food, either for meat or for the eggs they lay. Chickens used for meat are called broiler chickens. Broilers are young meat-type chickens that have weights ranging from 1.7 kg to 2.5 kg taking them 39-42 days to get to that weight (Growing Nova Scotiac 2012).

From 1991 to 2004, the annual growth rate of the production of chickens is 6.18% starting from the 286,874 tons of chicken produced since 1991. Meanwhile, in the Philippines, annual growth rate per capita consumption of chicken (in kg) is 4.33 % (Hi-ShungChang). These numbers are increasing every year, and people eat more and more chicken each year. That is why chicken farmers in the Philippines are concerned of multiplying the number of chickens they produce and improve on the quality of the chickens they produce (DOST 2011). For this reason, chicken growers devise many ways on how to grow chicken quickly to attain desirable marketable sizes and weights (Darre unknown). Large chicken growers may employ researchers to improve on poultry production. Studies on chicken feeding habits could help achieve this purpose.

Chickens use different senses to locate and eat the food given to them. One sense is the chicken's sense of smell. It is confirmed that the chicken is one of the birds known to have a good sense of smell (Ehrlich et al.c2011). The chicken usually scratches the ground and uses its eyes to find food, but it was found out that the chicken can smell blood and foul smelling things like rotten food (Dalton and SD c2011. There has been no study found to report the effects of chickens's sense of smell to their appetite.

Because of the demand of chickens, finding out more about the relationship between olfactory sense and feed preference of chicken serves may help improve the situation. People who will benefit from the possible outcome are mostly chicken farmers because if the chickens get more attracted to their feed, they can and probably eat more of it. When the chicken eats more, it will get bigger in less time and farmers who use this approach will have competitive advantage over those who do not. Chickens will grow faster and bigger within a short period of

time. Thus, farmers can have more profit as they save on time and cost of labor. This approach will also be friendlier to people because natural means to grow chicken are applied.

B. Statement of the Problem

Which among the feeds with different scents (banana fragrance, corn fragrance, carabao grass fragrance, and unscented) will be preferred by fifteen one-week old native chicks (*Gallus gallus domesticus*)?

C. Objectives

Is the Philippine native chicken's feed preference affected by its olfactory sense?

1. To calculate initial and final weights of the feeds (banana-scented, corn-scented, carabao grass-scent, unscented) before and after a five minute test conducted every weekend to fifteen one-week old chicks for three weeks.
2. To calculate the net weights of the feeds (banana-scented, corn-scented, carabao grass-scent, unscented) from the measured initial and final feed weights during the five minute test.
3. To determine the significance of the net feed weights of banana-scented, corn-scented, carabao-grass scented, and unscented feeds using Two-way Analysis of Variance (ANOVA)
4. To determine which among the feeds (banana-scented, corn-scented, banana-scented, unscented) the one week old chicks preferred based on the results of Two-way ANOVA

D. Hypothesis

It is hypothesized that the Philippine native chicken's feed preference is affected by its olfactory senses.

E. Significance of the Study

Chickens are common meats that people serve on the table every day at home, in restaurants, fast food chains and many more places. Since people like to eat a lot and because of the increase in the world's population from 6,974,036,375 in 2011 to a population of 7,045,027,097 in 2012 (GeoHive 2012), people need solutions to gain more out of something. In the Philippines, the chicken production, which accounts for 14.93% of total agricultural production, grew by 3.72 % in 2010 (PBAS 2010). This is one of the "most progressive animal enterprises in the Philippines" (BAR c2012). According to the Analysis of Philippine Chicken Industry by Chang, the chicken meat consumption in the Philippines is lower than the other countries in Asia and one of the issues that cause this is the inefficient production in poultry raising. If chicks get attracted to feeds, most probably the chicks will eat more of it and make them bigger, thus lessening time and effort producing heavy chickens for meat.

F. Scope and Delimitations

The study focused on the relation between the feed preference of the Philippine native chicken (*Gallus gallus domesticus*) and its olfactory sense. Some of the natural materials the chickens feed on (banana, corn, carabao grass) were gathered, blended, and integrated to filter papers which were shredded and mixed with feeds of the same kind which were placed in three separate but of the same kind feeders. There is one feeder that contains unscented feed to serve as the control. The feeds were presented to fifteen one-week old native chicks every weekend for three weeks. A five-minute test was conducted during the feeding and initial and final feed weights were gathered at the conduct of the test. After the feeding period, the net weights were calculated from the collected initial and final feed weights and were analyzed using Two-way Analysis of Variance. After analysis, the results were interpreted to determine which among the presented feeds the chicks preferred. This study was conducted in Sinikway, Oton, Iloilo City on January 2013. A part of the lot was borrowed for the chicken coops the whole period of the study.

From the idea of animal behavior, the study was narrowed down to the olfactory sense of the chicken. The types of scents used for the study was delimited to natural substances consumed

by chickens. The possible weakness was unexpected change in the weather that might have affected the feeding behavior of chickens. Another was inaccurate measurement of weights.

G. Definition of Terms

- **Fragrance** is a sweet or pleasant odor from a substance, whether these are naturally or artificially made. It is usually used to attract individuals with well-developed olfactory organ.

  In the study, fragrance was the changed variable applied to the feeds.

- **Olfactory sense** is the sense of smell. Olfactory bulbs are the main functional unit of this sense which is present in species that can detect smell. With the help of this sense, fragrance usually becomes significant especially to those species with a sharp, highly-developed olfactory sense.

  The olfactory sense was the sense that the chicks used in the study.

- **Poultry** are any domesticated or commercialized type of birds that are used for production of eggs and/or meat. Examples are chickens, ducks, and turkeys (Chiba 2009). The Philippine native chicken (*Gallus gallusdomesticus*) was the poultry bird that was used for the study of feed preference by olfactory sense.

- **Preference** is the selection of a substance over the other. This can vary among chickens. The feeding preference was the factor that has been tested in the study.

CHAPTER 2

REVIEW OF RELATED LITERATURE

A. Chickens

A.1 Information

Chickens belong to the type of birds under poultry industry. They are raised for their eggs and/or meat (Chiba 2009). Egg-producing chickens are classified as layers; Meat-providing chickens, in the other hand, are called broilers. Layer chicks are fed with starter mash from day old up to 8-10 weeks of age. From 8-16 weeks, they'll be fed with growing mash. During this growth period, the percentage of the feed they consume will be cut since they're not allowed to become fat to avoid poor egg production and high mortality rate. Broiler chickens are fed until the age of 8 weeks which is the marketing age. The feeds that are fed to them usually contain growth-promoting substances for more meat (PDA c2012)

Aside from poultry industry, the chickens are also proven to be useful in scientific researches. They have been used as animal models for the study of diseases, nutrition, immune response that are applied now in animal and human health (Burgos and Burgos 2006).

A.2 Common Species in the Philippines

The most dominant species of the chicken in the Philippines is the Philippine native chicken (*Gallus gallusdomesticus*). Chicken population was estimated to be 159 million in 2010 which is slightly higher (0.2%) than the last year's population. Almost half of the population was accounted for native chicken raised in backyard farms while the other half were taken up by commercial broilers (PINc2011).

A.3 Feeding and Nutrition

The feeds of the chickens are usually enhanced with vitamins, minerals, and protein/amino acids. There are also additives such as antibiotics, anti-oxidants, grits, and xanthophylls. Chickens aging from two to three weeks old were fed with starter feeds. Broiler diet has two types: grower diets for three to six weeks age of chicken and finisher withdrawal

diets which are fed six weeks age and up. In the selection of the feedstuff, nutrient availability, palatability, undesirable contaminants, and cost and availability is concerned. During extremely hot weather where the chickens' water consumption is doubled, drugs and additives must not be placed on the water. The water and feed distribution must not be more than 1.5 meters away from the chickens. The feeders must not be left empty for more than one hour. The schedule of feeding the chicken especially the first 3 weeks must be definite (Chiba 2009; PDA c2012).

There are farms that use organic materials for alternatives on commercial chicken feeds. However, there are some limitations to its use due to other factors: nutritional, technical, and socio-economical. Examples of these factors are some of the organic feedstuffs are season-based, high-fiber content and bulky. These organic and alternative feedstuffs for chickens includes wheat, blood meal, banana and plantain meal, barley or oats, and maize (NSWDPI 2007;Ravindran [date unknown]). The Philippine native chicken *Gallus gallusdomesticus* can also be fed by organic feedstuff (DOA [updated 2012]) or commercially-made feeds.

A.4 Requirements for a Chicken Coop

In a chicken coop, ample ventilation must be observed where enough oxygen goes in and carbon dioxide along with the excess moisture is removed. The temperature must be maintained at 18°-29°C. Proper lighting is also observe, well-lit brooders encourages chickens to eat. The "most cost effective" light source is sunlight. The windows for the sunlight to enter must be just above the chicken's height level to prevent direct sunlight contact to the chickens' eyes and lit up the top and the entire space beneath. The windows must be big enough to cover up each of the chicken coop's corners. There must be a wide space for the chickens to move around to avoid overcrowding. Cleanliness must always be observed and the quarters must be dry to avoid contamination of parasites and diseases. The shelter must be positioned far away from predators' reach (Keene c2009;PDA c2012).

A.5 Importance

Chickens are used in many ways: eggs, feathers, and the meat are used for human consumption and scientific researches. It is a good source of protein, selenium, and has niacin, a cancer-protective B vitamin (HSPH [Updated 2012]; TRUC c2005; WHF [Updated 2012]).The Philippine native chicken (*Gallus gallusdomesticus*) has been used scientifically as animal

research models for studies in human and animal health subjects like diseases and immune responses (Burgos Si and Burgos Se 2006).

The present market demands for it due to its unique flavor compared to other chickens (PBI [updated 2012], PCARRD [updated 2012]). The Department of Agrarian Reform encourages its "reform beneficiaries to consider native chicken production as one way of increasing their income (PIA 2011)."

A.6 Scents

Scents are molecules that is produced by one or more volatile chemical substances, usually in low concentrations, that can be perceive using the olfactory sense (Axel 1995). The scents used for the study were chosen based on what was observed the chickens were eating naturally, easily accessed, and also because of the nutrients that the chicken can get from the scent materials (FantasticFarms.com 2007). That was why banana, grass, and corn were the chosen materials for scent.

A.6.1 Corn

Corn (*Zea mays*) came from one of the four wild species of genus *Zea*, *Zea Mexicana*, also known as teosinte, which are native to Mexico and northern Central America. It mainly came from the Balsas race of teosinte which is found in the Balsas River basin in the Michoacan-Guerrero border region of western Mexico. With the help of C_4-type photosynthesis, corn grows fast annually and grows well in bright sun with limited water. Corn has unisexual infloresences: the tassel(male) and the ear(female). In 16th and 17th century, corn was introduced and accepted in Africa. It displaces rice in the drier regions. It was thought that the Portuguese introduced corn in the Asian regions where it was now widely grown but not majorly replaced rice (Sauer 1993). Corn is a good source of protein and calcium that the chickens need in order to survive. It also contains fats and vitamins needed for survival. Aside from that, it is not harmful for chickens. The corn was chosen because dried corn was usually fed to chickens as an alternative to commercial chicken feed and because it is rich in protein (FIT DAY 2008). The dried corn can be bought at a cheap price and poultry farmers save a lot of money. Corn is accessible and not seasonal. It can be bought at the grocery, streets, etc.

A.6.2 Carabao grass

Carabao grass (*Paspalum conjugatum*) is a "vigorous, creeping perennial with long stolons, rooting at the nodes, with culms ascending to erect", has a height of 40-100cm, "branching, solid," and "slightly compressed". Its origin is the American tropics, neutralized in South-East Asia and tropical countries in the world, and commonly found in Indonesia, Philippines, and in the Pacific Islands. Carabao grass grows "near sea-level up to 1700m altitude in open to moderately shaded places", fit in humid climates, and grows in many numbers below plantation crops and disturbed areas like roadsides and stream banks. This grass is considered a food source for grazed animals and also "rated as a very important natural pasture grass in coconut plantations." It can grow on many types of soil (Manidool 1992). Since chicken need energy, grass is a good source of energy. The cellulose contains energy which the chickens can use in sustaining itself. These energy sources can be the protein, fats, or minerals needed by the chicken to survive (FantasticFarms.com 2007). The carabao grass (*Paspalum conjugatum*) was chosen because wild chickens eat grass as food. When no available source of food is available, grass is an option as food because of the nutrients it provides. Also, grass is readily found everywhere. So accessibility of the raw material was considered in choosing grass as scent.

A.6.3 Banana

Banana (*Musa acuminata*) is a species of wild bananas native to the Malay Peninsula and its nearby regions. Some variety showed up due to hybridization between *Musa acuminata* and *Musa balbisiana.* These varieties can be found from India eastwards up to the tropical islands of the Pacific. Despite of large amount exportation of bananas from the tropical countries to the temperate countries, mainly in North America and Europe, 85% of all bananas produced are from small farms and are distributed locally (Sauer 1993). Banana may flower at any time of the year. Its inflorescence is almost horizontal or downward-oriented, becoming pendulous when the fruit matured. A fruit bunch requires 100 days in order to mature. This species of banana grow best in moist, organic soils with 5.5-7.0 pH level. Its number is usually propagated by removal of suckers or pieces of rhizome from the original plant (Lemke 2012). Banana can also be a good source of protein but not as much as what the corn and grass can provide. While corn can give up to 8% of the total ratio as protein (FIT DAY 2008) and grass can give up to 6% to 17% of the

total ratio as protein (e-Gerbil 2008), the banana can only give a total of 2% of the total ratio as protein. But bananas can easily be digested and can instantly replenish energy to the body (nutrition-and-you 2009). The banana was chosen as a scent material because chickens were able to eat them properly. Other than that, the banana was also cheap, readily accessible, and it did not negative side effects to the chickens.

A.7 Scent Preference

Unlike in humans, the scent preference of chicken is still unknown because there have been no studies conducted concerning the chicken's sense of smell. But there are information regarding its sense of smell. Chickens are not keen on food that smells of mould or is sour (Dalton 2008). This means that smell can presumably be involved in the preference of the food it ate. Another is that birds can definitely smell blood. Since chickens are omnivores, small mammals such as mice can be part of its diet. It can be inferred that chickens have a specific preference on what it eats.

A.8 Olfactory Sense

Olfactory receptor (OR) proteins interact with odorant molecules in the nose, initiating a response that triggers the perception of a smell. The OR family is one of the largest known mammalian gene families with around 900 genes in humans. Sequence and copy number polymorphisms in OR genes have been described, which may account for inter-individual differences in odorant detection thresholds.

The ability to detect smells serves essential and aesthetic functions in vertebrates. Many species rely heavily on their sense of smell to locate food, detect predators or other angers, navigate, and communicate (Oxford Journals 2002).

B. Repeated measures analysis-of-variance (ANOVA)

Repeated measures Analysis of Variance (ANOVA) is a statistical method of measuring whether there's a change or not over a period of time. It compares "the average score at multiple time periods for a single group of subjects." (TUT c2012)

C. Related Literature

The stimuli induced by an identical odor, even in a different way of presentation, have the same effect to the members of the same species. Species, guided by the olfaction toward oil slicks, "behaved as described by Hutchison and Wenzel (1980) for procellariiforms approaching a raft, with zigzag crosswind excursions becoming narrower as the birds came close to the source of the stimulus." Those species that are guided by olfaction approached the source of odor "by flying against the wind very close to the surface, whereas other species approached from a direction independent of wind direction and from a greater height."(Verheyden and Jouventin 1994).

Wandering albatross (*Diomedeaexulans*), with the help of their large olfactory bulbs, pick up fishy-scented odors and locate them. They are "facilitated by crosswind flight to optimize the probability of encountering a plume emanating from a prey item, followed by upwind, zigzag flight to locate the prey". "Initial olfactory detection was implicated in 46.8% of all flown approaches in prey-capture events, accounting for 45.5% of total prey mass captured by in-flight foraging". These results reflect on area-restricted search at the large spatial scales of the open ocean (Nevitt, Losekoot, and Welmerskirch 2008).

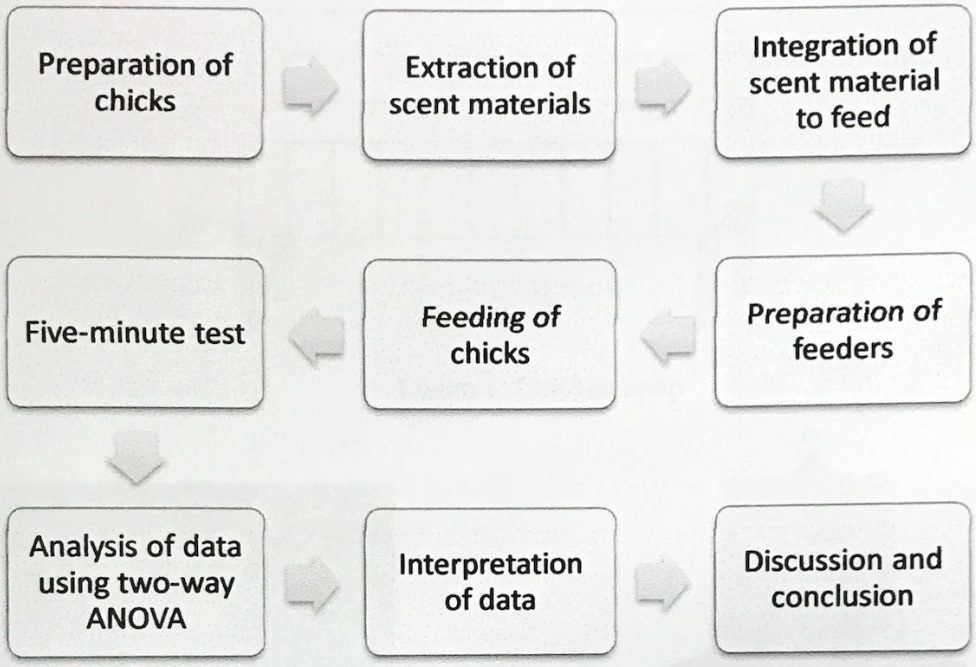
Chickens show no signs of feed preference on cereal grain additions to the control feeds. The differences of the feed consumption cannot be attributed also to the size of the feed due to the fact that there is no differences in the size between the control and the one that had additives on it (Stammen, Latshaw 2010).

Wandering albatrosses (Diomedeaexulans) have the capability to detect food in olfactory, sight, and combined tests. Olfactory and sight tests have shown "additional effects on the exploratory behaviors of males. (Mardon et al 2010)"

CHAPTER 3

METHODOLOGY

A. Schematic Diagram of Methods



B. Preparation of the Research Experiment

B.1 Preparation of the Study Area

The study was conducted on the month of January. The feeding of the chicks and scented filter paper making was conducted at Sinikway, Oton, Iloilo City for three weeks.

B.2 Materials and Equipment

B.2.1 Chicken coop and Equipments

There were two chicken coops, each with dimensions 10ft.x1.5ft.x2ft.and elevated two feet above the ground. There were 10 compartments in each coop (Fig.1). Each compartment will contain 1 chick only. The feeders (Fig.2) and waterers (Fig.3) were provided in every

compartment. The height of the feeders and waterers was the same height as the chick's back. This is for the ease of the chicks so that they will not get strained as stated in Helpful Tips for Taking Care of Your Newly Hatched Chicks (Gail Damerow 2007).. The coops were delivered from the seller to the study area via jeepney.

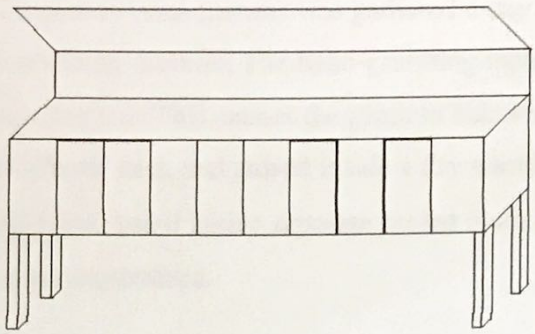


Figure 1. Chicken coop

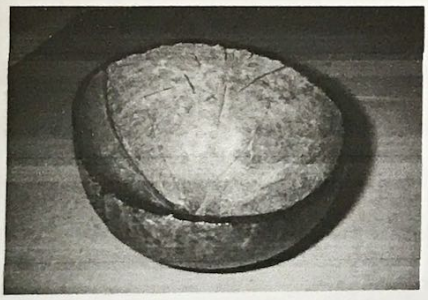


Figure 2. Feeder

Figure 3. Waterer

B.2.2 Scent materials

Corn (*Zea mays*) cobs with moist husks, full corn kernels, and dark silk "hair" protruding in the head were chosen (Stradley unpublished). The corns were bought from a vendor in Tagbak Terminal, Jaro, Iloilo City, Philippines where they store the corns in shade rather than under the sunlight since the heat can cause the starch ratio against sugar to rapidly raise. The more starch present in the corn, the harder it would be, making the extraction harder. The freshness of the corn was be determined by looking at the stalk where the corn cob has been cut. If the stalk already turned brown, it's about two days old already (KS 2007). The corn that was bought was one day old.

The bananas (*Musa acuminata*) that were chosen were in bright yellow color and firm. The peels were free of cuts and bruises (S 2011). The bananas were yellow in color and have black spots all over its body as a sign of ripeness through natural ways and without any use of chemicals (BC 2011). The bananas were bought while they were still in their bunch.

The carabao grass (*Paspalum conjugatum*) was gathered a day before the extraction. The grass was gathered by hand-grabbing method. The hand-grabbing method is done by pulling the revealed part of the grass from ground. This causes the grass to become uprooted. The leaves were placed in a sealed black plastic sack and stored inside a dry warehouse at room temperature

All the three materials were stored inside separate sealed black plastic sacks and placed inside a dry warehouse at room temperature.

B.2.3 Chickens

The chicks were bought at PACIFICA Agrivet, Delgado St., Iloilo City, Philippines. They were handpicked individually to pick the best chicks. The chicks were considered best if they are clean, dry, and free from dirt and contamination, with clear bright eyes, free from deformities, with a completely sealed and clean navel. The body should be firm to touch and there should be no signs of respiratory stress. The legs should have the normal conformation, with no swelling and no hock or skin lesions; the beak should be well formed and the toes firm and straight (Funk and Irwin, 1995; Raghavan, 1999). The chicks were one-week old.

The chicks were assigned with random numbers. The numbers were written in a piece of paper and placed in a fish bowl. A random number was drawn from the fishbowl. The number drawn was the number of the chick that will be placed in the first coop. The method was repeated until 15 chicks were drawn and immediately placed in their respective chicken cages.

B.2.4 Feeds

The chicks were fed with mash starter feeds. The feeds were placed in the feeders using a plastic trowel. The feeds were stored inside plastics and placed inside a sealed plastic bucket for future use. The bucket was also stored in the dry warehouse at room temperature. The warehouse was cleaned once every three days using hard brooms, clean water, and rags.

B.3 Preparation of the Scented Paper

The raw materials (banana, corn, carabao grass) were separately blended in a blender. The banana was blended first. Three bananas were blended in a blender with one cup of water. They were blended for one minute or until the mixture was fine. After blending, fifteen pieces of 5x5 inch filter paper was soaked in the mixture for two minutes. After soaking, the filter papers were placed on top of a 3x1 feet aluminum foil and left to dry overnight. After drying, the filter papers were then shredded into little pieces and placed in zip locks to prevent the paper from spoiling. The whole procedure was repeated using b) corn and c) carabao grass as the other scents.

C. Experiment Proceedings

C.1 Feeding of the Chicks

There'd been four feeders in one coop. The feeders have been placed in each corner of the chicken coop. The waterer was placed in the middle of the chicken coop. Three of the feeders contained the shredded scented papers while one was free of scent for control. One feeder contained 50 grams of feed and the carabao grass scent. Another feeder contained 50 grams of feed and the corn scent. And the other feeder contained 50 grams of feed and the banana scent. The total amount of feed given each day was 2 kilograms. The chicks were fed with starter mash feeds at 6 AM daily. The position of the feeders was switched each day to avoid positional bias (Willson et al. 1990). The feeds and scented papers were replaced each day. One liter of water per day was provided for each coop. The feeding was conducted for twenty-one days.

C.2 Gathering of Data

A five-minute test was conducted every seven days (day 7, day 14, and day 21) of the feeding duration. The weight of the feed before and after feeding was measured using a calibrated digital weighing scale. The weighed feed wasthrown in a compost pit. The data gathered was placed in a data sheet. It was then analyzed using two-way Analysis of Variance (ANOVA).

D. Other concerns

D.1 Management of the Chicken Coop

The chicken coops were cleaned daily. Hard brooms were used to sweep the floor of the coop. The feeders were emptied, washed, and disinfected daily with dishwashing liquid. The feeding time of the chickens was strictly observed since the feeders can't be left empty for one to two hours. The wastes were thrown in a compost pit. The waterers were cleaned daily by emptying and replacing the water inside it. The waterer was refilled using deep-well water.

D.2 Storage of Feed

The storehouse was cleaned once every three days. The feeds were stored in sacks at room temperature.

D.3 Disposal of Chickens

After the conduct of the study, the chickens were sold to an interested buyer.

E. Data sheet

Data Sheet No.:_____ **Date:_____**

Feeds	Initial Feed weight	Final feed weight	Net Feed Weight
Control			
Banana			
Carabao grass			
Corn			

Type of scent	Net weight of feeds (g)					
	Week 1		Week 2		Week 3	
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Control						
Banana						
Carabao grass						
Corn						

CHAPTER 4

RESULTS AND DISCUSSION

The experiment was conducted for three weeks. The chicks were fed with unscented feed during the weekdays, and scented (banana, carabao grass, and corn) with one control during the weekends. A five-minute test was conducted during the weekend, measuring the feed weight before and after the test. The summary of the net feed weight was shown in Table 1.

Table 1. Scents and Net Weights

Type of scent	Net weight of feeds (g)		
	Week 1	Week 2	Week 3
Control	142	70	70
Banana	145	65	35
Carabao grass	135	85	27
Corn	165	70	11.5

Two-way Analysis of Variance (ANOVA) was used (Fig.4). The data presents sufficient evidence that net weight of feed consumed by chickens depends on the time of feeding (i.e., weekly) (Fig.6). This is indicated by an F value of 35.13 with a highly significant probability value of 0.000010 (Table 2). There was a significant difference between the net weight feed of the control and the scented feeds although there's a little significant difference between the scented feeds (α= 0.05) (Fig.5). The scents and day of feeding has interaction in affecting the amount of feeds consumed by the chicks (Fig. 7).

Table 2. Summary table of the Two-Way ANOVA

Effect	df Effect	MS Effect	df Error	MS Error	F	p-level
Scent	3	214.49	12	726.7083	0.29515	0.828203
Time of Feeding (Week)	2	2553.29	12	726.7083	35.13142	0.000010***
	6	746.07	12	726.7083	1.02664	0.453862

Based on the results, there is a significant difference among the net weight of the feeds (α= 0.05). This means that the olfactory sense of the chickens affect the amount of feed the chicks consumed. Scented feeds are preferred by the chicks rather than the unscented ones although the type of scent that they like is undefined.

The materials that were used for the study are some of the common natural materials that the chicken *Gallus gallusdomesticus*fed on (Ravindran 2011). Chickens are regarded to have a good olfactory sense and used it for several tasks like navigation (Dalton 2008, SD 2008, Erhlich 1988). The experiment agrees with this fact as the chicks fed more feeds when there are scents applied to the feeds.

Somehow, the date and time of the experiment conduct had affected the net weight. As the experiment progressed, the chicks consumed less and less feeds. The reason might be the aging of the test specimen. According to Jacob et.al, chicks feed consumption changes as they get older. They consume less feed as they grow (CEUC 1983).

However, there were some things that might have affected the experiment. The weather is unpredictable which probably caused raise and drop in temperature, affecting the feed intake. There are few spilled feeds, although newspapers were used to catch them and still include them in the final weight count. The measurements of the weights were accurate but not precise.

This study can be applied in feeding the chickens especially to the poultry industry. The scents can boost the amount of feed the chickens eat. Because of that, the chickens will grow bigger since more food means bigger chickens. Bigger chickens are needed in the Philippines since there is a problem in the meat weight among the chickens. The population is rising which

demands more food supply. By having bigger chicken, more meat will be provided for the people. However, the users should not feed the chickens too much or else the chickens will die.

CHAPTER 5

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This study aims to know whether the chicken *Gallus gallusdomesticus*' feed preference is affected by its olfactory test by feeding 20 chicks, (1) calculating the initial and final weight before and after the five-minute test, (2) solving for the net weight and, (3) analyze the data using Two-way Analysis of Variance (ANOVA).

A. Summary

The chicks were fed for three weeks. A five-minute test was conducted every weekend. The initial and final weight feeds were taken down in a data sheet. The net weight was then calculated (Table 1). From week one to week three the net weights of feeds consumed by the chicks decreased, from 142g to 70g in the unscented feed, 145g to 35g in the banana-scented feed, 135g to 27g in the carabao grass-scented feed, and 165g to 11.5g in the corn-scented feed. The data was analyzed using two-way ANOVA (Fig.5, Table 2) that wielded a significant result ($\alpha = 0.05$).

B. Conclusion

In conclusion, the chicken *Gallus gallusdomesticus* preference on the feeds is significantly affected by its olfactory sense. The chicks prefer scented feeds compared to the unscented feed although there is no specific scent on which the chicks are attracted the most ($\alpha = 0.05$).

C. Recommendations

For further studies, it is recommended to:

- use other variety of scents (e.g. orange)
- extract natural materials by steam distillation method instead of blending to be able to get stronger scents
- improve cage dimensions
- longer conduct of the study

- more test specimen (chicks)

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APPENDIX

A. Raw Data

Data Sheet No.: 1 **Date:**_____

Feeds	Initial Feed weight (g)	Final feed weight (g)	Net Feed Weight (g)
Control	500	330	170
Banana	500	320	180
Carabao grass	500	335	165
Corn	500	310	190

Data Sheet No.: 2 **Date:**_____

Feeds	Initial Feed weight (g)	Final feed weight (g)	Net Feed Weight (g)
Control	500	386	114
Banana	500	390	110
Carabao grass	500	395	105
Corn	500	360	140

Data Sheet No.: 3 **Date:**_____

Feeds	Initial Feed weight (g)	Final feed weight (g)	Net Feed Weight (g)
Control	500	440	60
Banana	500	448	52
Carabao grass	500	400	100
Corn	500	420	80

Data Sheet No.: 4 **Date:**_____

Feeds	Initial Feed weight (g)	Final feed weight (g)	Net Feed Weight (g)
Control	500	420	80
Banana	500	422	78
Carabao grass	500	430	70
Corn	500	440	60

Data Sheet No.: 5 **Date:**_____

Feeds	Initial Feed weight (g)	Final feed weight (g)	Net Feed Weight (g)
Control	500	436	64
Banana	500	478	22
Carabao grass	500	468	32
Corn	500	490	10

Data Sheet No.: 6 **Date:**_____

Feeds	Initial Feed weight (g)	Final feed weight (g)	Net Feed Weight (g)
Control	500	424	76
Banana	500	452	48
Carabao grass	500	478	22
Corn	500	487	13

B. Figures

Summary of all Effects; design: (scent study2.sta)

GENERAL MANOVA: 1-SCENT, 2-WEEK

Effect	df Effect	MS Effect	df Error	MS Error	F	p-level
1	3	214.49	12	726.7083	.29515	.828203
2	2	25530.29	12	726.7083	35.13142	.000010
12	6	746.07	12	726.7083	1.02664	.453862

Data: SCENT STUDY2.STA...

TEXT VALUES	1 SCENT	2 WEEK	3 NETW
Chicken1	Control	Week1	170
Chicken2	Banana	Week1	180
Chicken3	Carabao	Week1	165
Chicken4	Corn	Week1	190
Chicken5	Control	Week1	114
Chicken6	Banana	Week1	110
Chicken7	Carabao	Week1	105
Chicken8	Corn	Week1	140
Chicken9	Control	Week2	60
Chicken10	Banana	Week2	52
Chicken11	Carabao	Week2	100
Chicken12	Corn	Week2	80
Chicken13	Control	Week2	80
Chicken14	Banana	Week2	78
Chicken15	Carabao	Week2	70
Chicken16	Corn	Week2	60
Chicken17	Control	Week3	64
Chicken18	Banana	Week3	22
Chicken19	Carabao	Week3	32
Chicken20	Corn	Week3	10
Chicken21	Control	Week3	76
Chicken22	Banana	Week3	48
Chicken23	Carabao	Week3	22
Chicken24	Corn	Week3	13

Table of All Effects

Design: 1-SCENT, 2-WEEK

Effect		df Effect	MS Effect	df Error	MS Error	F	p-level
SCENT		3	214.	12	726.71	.295	.8282
WEEK	*	2	25530.	12	726.71	35.131	.0000*
12		6	746.	12	726.71	1.027	.4539

Figure 4. Two-Way ANOVA

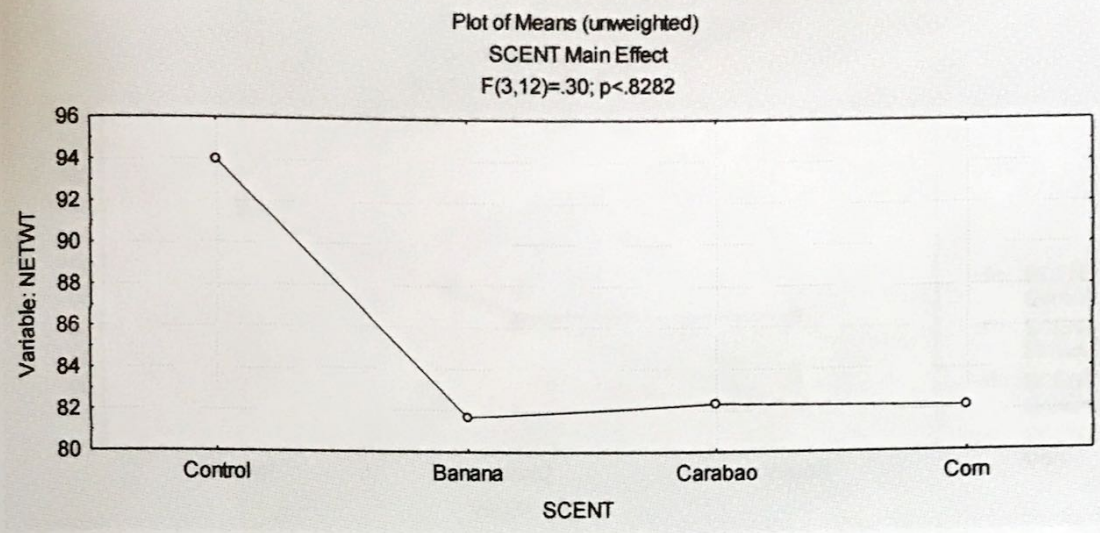

Figure 5. Graph of scent vs. weight

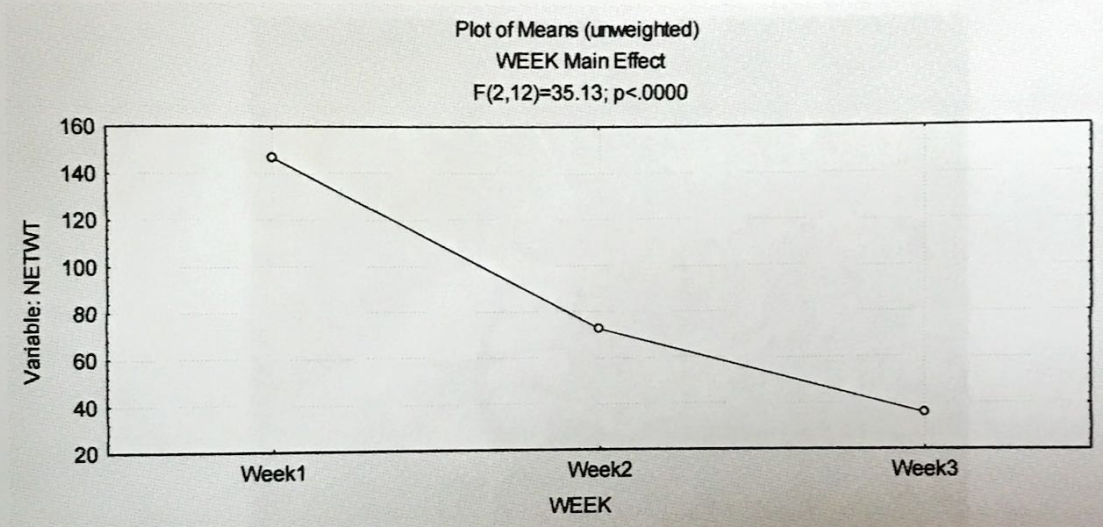

Figure 6. Graph of time of feeding and weight

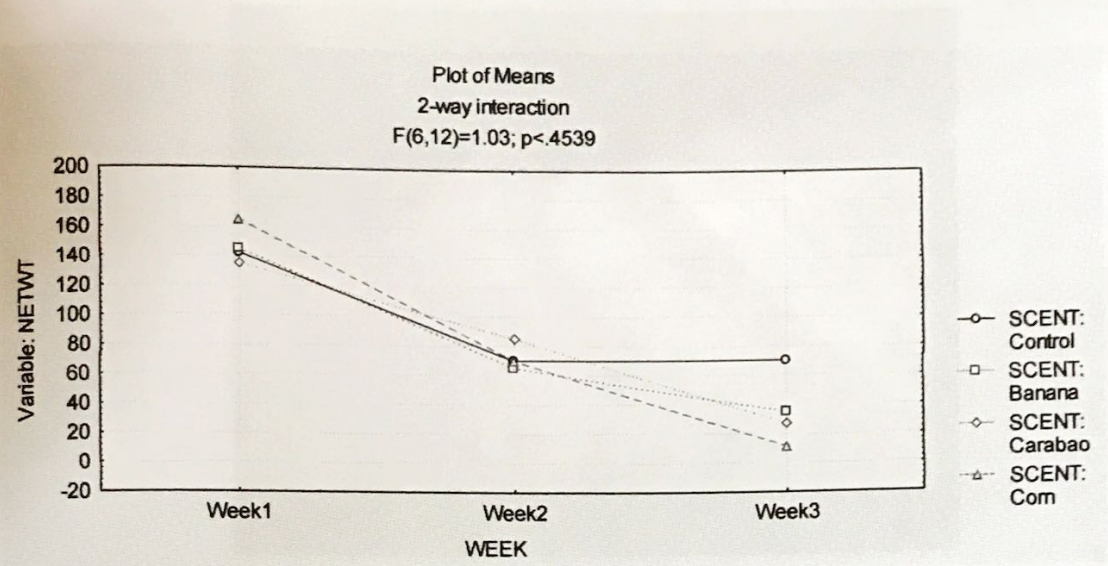

Figure 7. Graph of interaction between scent and time of feeding

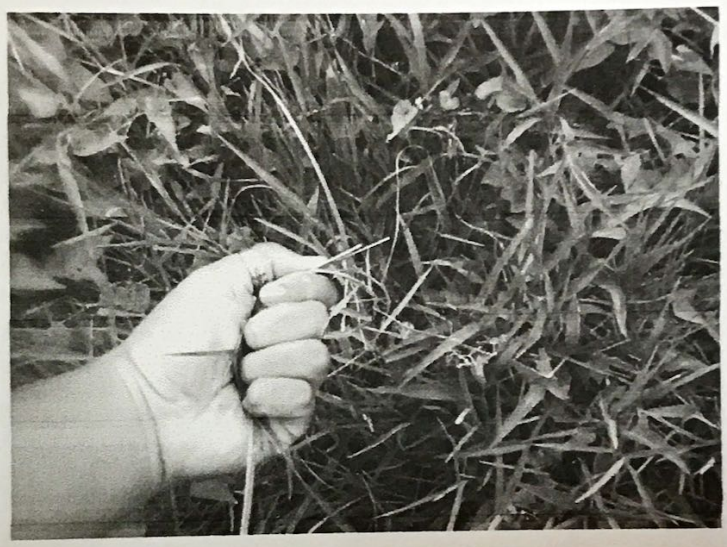

Figure 8. Collecting Grass using the hand

Figure 9. Collecting of Banana

Figure 10. Blending of Grass

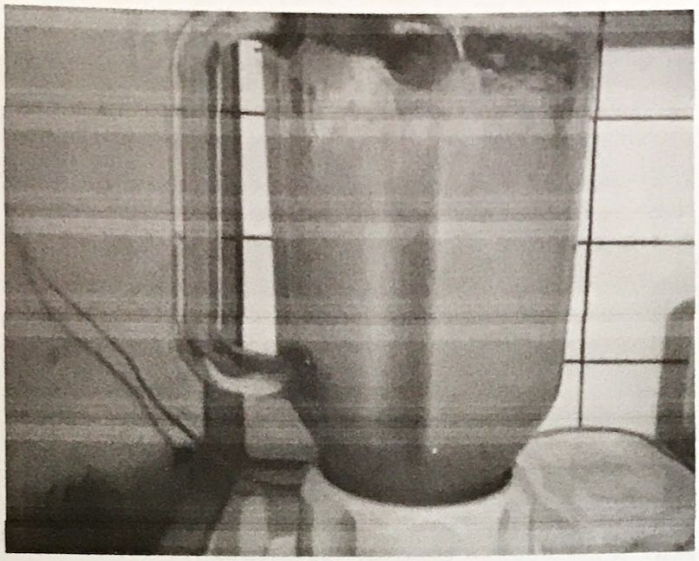

Figure 11. Blending of Banana

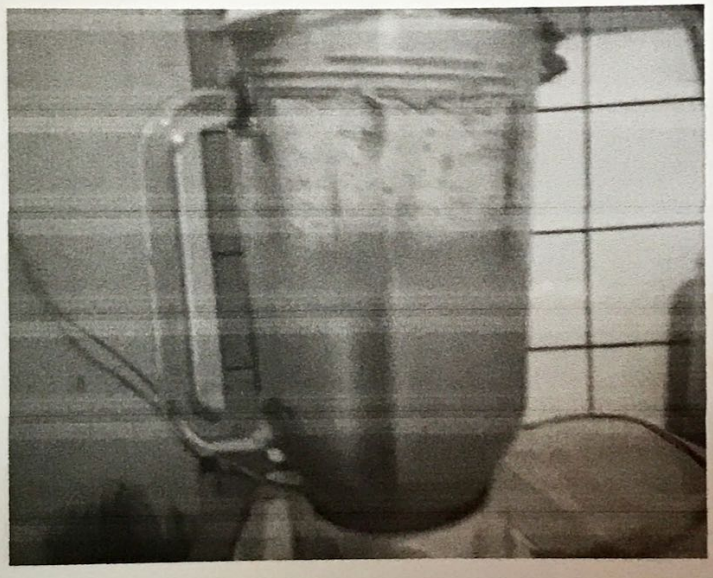

Figure 12. Blending of Corn

Figure 13. Drying of Grass scented paper

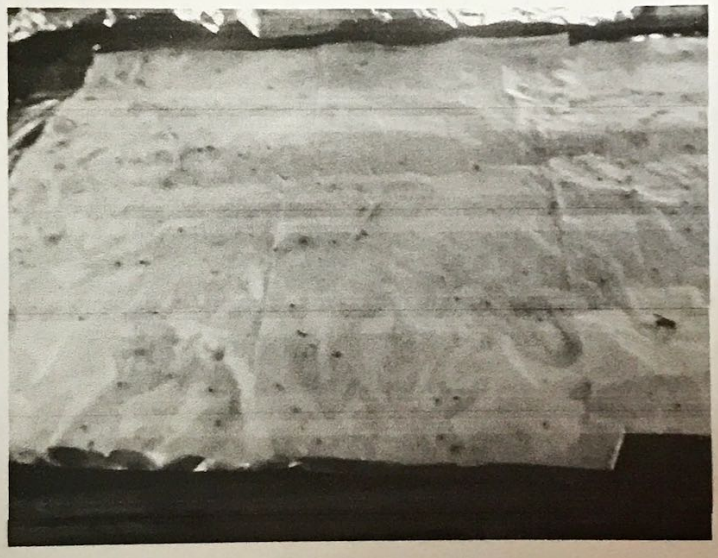

Figure 14. Drying Banana scented paper

Figure 15. Drying of Corn scented paper

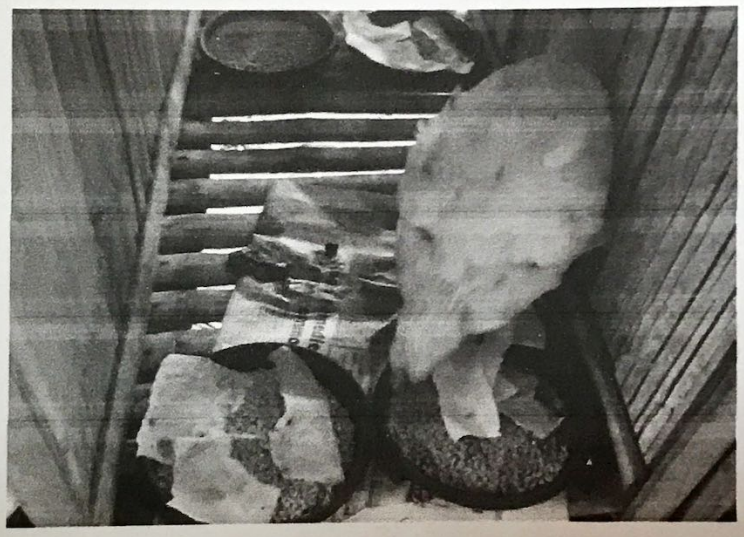

Figure 16. Feeding of the chickens (Day 14)