California Polytechnic State University
San Luis Obispo

Internship Project at the Poultry Unit

Supervisor: Dr. Bill Kellogg
Candidate: Weston Forbes
Graduate Internship in Agricultural Education
## Table of Contents

<table>
<thead>
<tr>
<th>Areas covered</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Carrying out electrical wire connection</td>
<td>2</td>
</tr>
<tr>
<td>Eggs delivered in the San Luis Obispo Area</td>
<td>3-5</td>
</tr>
<tr>
<td>Belts carrying eggs</td>
<td>6</td>
</tr>
<tr>
<td>Monitoring and collection of eggs</td>
<td>7</td>
</tr>
<tr>
<td>Mechanical collection of eggs</td>
<td>8</td>
</tr>
<tr>
<td>Egg sorting, grading and packaging process</td>
<td>9-10</td>
</tr>
<tr>
<td>Egg grading</td>
<td>11-12</td>
</tr>
<tr>
<td>Layer house check</td>
<td>13</td>
</tr>
<tr>
<td>Automatic feeder operation</td>
<td>14</td>
</tr>
<tr>
<td>Egg candling process</td>
<td>15-16</td>
</tr>
<tr>
<td>Cal Poly State University Hatchery</td>
<td>17</td>
</tr>
<tr>
<td>Hatchery Unit</td>
<td>18</td>
</tr>
<tr>
<td>Candling fertilize eggs</td>
<td>19</td>
</tr>
<tr>
<td>Hatching of fertilized eggs</td>
<td>20</td>
</tr>
<tr>
<td>Removal of chicks</td>
<td>21</td>
</tr>
<tr>
<td>Accommodation for day chicks</td>
<td>22</td>
</tr>
<tr>
<td>Egg storage in the cooling room</td>
<td>23</td>
</tr>
<tr>
<td>Carton box preparation</td>
<td>24</td>
</tr>
<tr>
<td>Egg grading operation process</td>
<td>25</td>
</tr>
<tr>
<td>Lighting accommodation for birds</td>
<td>26</td>
</tr>
<tr>
<td>Broiler house preparation</td>
<td>27</td>
</tr>
<tr>
<td>Egg packer machine</td>
<td>28</td>
</tr>
</tbody>
</table>
Making preparation for litter bedding
Truck delivering rice hull
Feed & water preparation in broiler house
Arrival of day old chicks in broiler house
Movement of birds in the house
Feed sources and water regulator
Raking and turning the litter
Feed driven motor
Display of computerized monitor
Blood sampling on broiler birds
Method and technique use of syringe
Providing adequate lighting for broiler birds
Weighing birds
Weighing cart
Final week for birds’ departure
Last day of the birds’ departure
Final day of the birds’ departure
Departure of broiler birds
Post load out of broiler house cleaning up
Conclusion
References
Introduction

The idea of putting this paper together comes real the fact that will share with my readers. Thanks to my supervisor Dr. Bill Kellogg, who gave me great sounds of advice in putting this project together. Also, thanks to Steve Sodenstrom Farm Manager; Joseph Gardner Enterprise instructor; and student Bradley Schrader with whom I worked, in order to make this project possible.

During the period of my internship at California Polytechnic State University Poultry Unit, I learned a wide area of knowledge as it relates to poultry production, management, and operations of the poultry farm.

In this booklet, there are some areas that I have worked in; so as to gain experience that will help me better as an agriculture teacher, where I will be able to demonstrate these good practices to students in Jamaica.

The practical experience gained as an intern, was highly appreciated. It allows me will to make great improvements in the practical field of guiding students to become better citizens of Jamaica in the field of work in the near future.

The modern trend in production is toward large, highly specialized flocks. The high-quality broiler and egg produced under this system lends itself very well to the use of machine flash candling equipment or mass electronic scanning devices to detect checks, irregular shells, dirt, meat and blood spots, and loss eggs. For this reason, it is highly desirable for students to have a working knowledge of these systems.

Graduate Candidate,

Weston Forbes.
Carrying out electrical wire connection

- There was a stoppage on one of the belts, causing a delay in egg collection.
- I was able to find and correct the fault (problem) for smooth operation of egg collection.
Egg delivery to places in the San Luis Obispo Area.
For the successful transport of shell eggs three essential requirements must be met.

1. The containers and packaging materials must be such that the eggs are well protected against mechanical damage.

2. Care should be taken at all stages of handling and transport. Workers handling eggs should be instructed so that they appreciate the need for careful handling. The provision of convenient loading platforms at packing stations, loading depots and railing stations, and handling aids, such as hand trucks and lifts, are of great help.

3. The eggs must be protected at all times against exposure to temperatures that cause deterioration in quality as well as contamination, especially tainting.

The permissible range of temperatures during loading and transport depends on the local climatic conditions and the duration of the journey.

**Recommended temperatures for loading and transport**

<table>
<thead>
<tr>
<th></th>
<th>Transport over 2 or 3 days</th>
<th>Transport over 5 or 6 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum on loading</td>
<td>+6° C</td>
<td>+3° C</td>
</tr>
<tr>
<td>Recommended for</td>
<td>-1° to + 3° C</td>
<td>-1° to + 1° C</td>
</tr>
<tr>
<td>transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptable for</td>
<td>1° to + 6° C</td>
<td>1° to + 3° C</td>
</tr>
<tr>
<td>transport</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A basic prerequisite for all long-distance transport is that arrangements be made for proper reception, handling and storage at the end of the journey. This is especially important where large lots are delivered to a relatively small market. Without access to suitable storage facilities, the eggs may have to be marketed quickly under adverse climatic conditions, which may cause substantial quality deterioration and price losses.

Delivery of high quality eggs over long distances, especially in hot climates, generally calls for refrigeration and was done every Friday at 8am to 11am. Requirements for the successful operation of refrigerated transport equipment are rather rigid especially as regards the following factors:
• efficiency and durability of insulation;
• adequacy and reliability of the cooling mechanism; and
• adequate circulation of air within the vehicle or container so that variations of temperature are slight.
- This is another view of the egg transporting mechanisms within the layer house at Cal Poly Poultry Unit.
- The use of advanced mechanical engineering has greatly reduced the occurrences of human egg handling to the point that eggs are rarely touched by human hands.
Monitoring and collecting of eggs

- As the eggs reach the end of each level, the automatic collectors placed the eggs into the plastic egg handlers “D”.
- The plastic egg handlers carry the eggs directly to the egg processing packer machine via a large overhead belt.
Mechanical collection of eggs

- Mechanical collection of eggs is placed at the Cal Poly Poultry unit layer facility.
- It takes about 26 hours for each egg to develop and each hen lays an egg a little later each day.
- This is not an exact thing and most eggs are laid in the morning. Eggs are collected every day and transferred from the hen house to an egg room where they are graded or checked for weight and for damaged shells.
- A sample of eggs is often broken open to check internal quality. Eggs are packed into cartons for 12 eggs, 18 eggs or trays of 30 eggs for sale.
- Prices vary with egg size, so eggs must be separated on the basis of egg weight.
- This is done automatically by a machine called an egg grader.
Egg sorting, grading and packaging process

- Here the eggs are entering the first stage in the grading process.
- They are evaluated by an automated computerized detection system.
- Eggs are graded into categories of:
  1. Jumbo
  2. Extra large
  3. Large
  4. Loss quality standards.
- Even with good farm-management practices and careful handling, a small percentage of dirty eggs will be produced. Producers must bear in mind that dirty eggs are covered with bacteria that will cause spoilage if they enter the egg.
Whether conducted at the production or processing site, washing must be performed in a manner that will minimize the chances of bacterial penetration of the shell.

If these important facts are forgotten, and eggs are washed carelessly, more damage can be done than by leaving the dirt on the shell. Wetting a dirty shell provides moisture in which bacteria may breed and assists their growth and penetration through the shell.

A washing solution colder than the egg causes the egg content to contract and thus allows polluted water to be drawn through the shell. When washing eggs the following precautions should be followed:

1. Wash eggs with water at least 20 °F (11.1 °C) warmer than the internal temperature of the eggs and at a minimum of 90 °F (32.2 °C).
2. Select a detergent or detergent sanitizer that is compatible with the wash water and one that will not give off foreign odors that may be imparted to the egg.
3. Use only potable water with an iron content of less than 2 parts per million (p/m) for washing and keep wash water as clean as possible.
4. Rinse by spraying with water slightly or slightly warmer than the wash water.
5. Use an approved sanitizer in the spray rinse.
6. Dry the eggs to remove any excess moisture prior to packaging.
Egg grading operation process

- The eggs are graded by an automatic system from the different categories of 6 to 1 feeder in trays.
- Here human handling is required to place five (5) trays in each box in strategic points.
- After these boxes are filled, they are placed on the pallets for checking off.
- Packaging and packing are normally carried on in conjunction with the grading operation.
- Clean packaging and packing materials should ensure adequate protection of the product in the handling required in the grading station, distribution channels, and the retail store.
- Cartons or filler flats of eggs should be placed on conveyors gently and carefully moved to the packing station to minimize any additional breakage.
- Packaging materials should be new and free of mold, mustiness, or any other off-odors or conditions.
- Packing materials, such as wire or plastic baskets, or transport containers such as metal racks, should be reasonably clean and free of egg meat before use.
This is a view of the inside of layer house, where hens are housed on slanted wire-mesh cage floor.

Nipple waterers “A” serve as the hens’ source of water and feed is transported through the house via an auger system in feeders “B”.
Automatic feeder operation

- The birds are fed at ad lib using automatic shaft pilot to take in the feed.
- There is a transparent cover on the housing area carrying the feed that indicates the movement of the feed.
- There is also a red light located at the top on the motor sensor that tells the feeder automatic operation is on.
Egg Candling Process

- This process requires human handling that identify and remove all the crack and check egg before entering the grading area.
- The candling area should be darkened to the extent necessary to do an efficient job. The extent of darkness will vary depending on the type of processing equipment used.
- The light rays from the mass scanning area should be diverted away from the candler’s eyes.
- On high-production machines, it is generally best for a candler to also have another type of job assignment to prevent eyestrain, break the monotony, and improve efficiency of the candling operations.
- After candling, individual eggs are weighed using mechanical or electronic weighing equipment. Most modern processing equipment integrates weighing as an in-line component of the processing machine.
– The weighed eggs are segregated by weight classes and conveyed to the applicable size packing line. Packaging and packing are normally carried on in conjunction with the grading operation.
– Clean packaging and packing materials should ensure adequate protection of the product in the handling required in the grading station, distribution channels, and the retail store.
– Cartons or filler flats of eggs should be placed on conveyors gently and carefully moved to the packing station to minimize any additional breakage.
Cal Poly State University Hatchery

DO NOT ENTER if you have entered the following facilities at the Cal Poly Poultry unit today:

- Egg processing rooms
- Broiler house
- Floor pen
- Quail room
- Layer house
Fertilized eggs are placed in the incubator at a set temperature of 99.5 to 100°F with a humidity of 50%-60% for a period of 21 days.

Eggs are automatically turn three (3) times daily in order to prevent embryo mortality.

After 4-6 days the eggs candled to identify the heart of the embryo.
Candling fertilized eggs

- Candling eggs to observe embryo development.
Hatching of fertilized eggs

- In a dark room, hold the egg to the light of the candler to observe the contents of the egg. Cooling that occurs for short periods (less than 10 minutes) during careful examination of eggs does not harm the development of the embryo. However, limit the exposure of the egg to the hot light source. Even a brief period at 104 degrees F kills all embryos.
- The presence of embryos can be confirmed easily after 8 days to 12 days of incubation.
- The embryo is located in the large end of the egg, where blood vessels radiate under the surface of the shell.
- The embryo appears as a dark spot that becomes larger as incubation progresses. Eventually only a dark mass and the air cell are seen.
Removal of chicks
Accommodation for day chicks

- Immediately after the eggs are hatched, the birds were taken to an area to provide heat from the brooding system and water for their growth development.
Eggs storage in the cooling room

- Cooler rooms should be free from objectionable odors and mold and should be maintained in a sanitary condition at all times.
- The coolers must be capable of maintaining the temperature and humidity necessary for the preservation of eggs.
- Coolers should be equipped with thermometers and hygrometers to verify and monitor temperature and humidity.
- These eggs are ready for processing in the following areas:
  Collection of eggs using vacuum
  Steamed washed
  Candled
  Graded
  Package
- The eggs are placed on the belt using an air vacuum, which automatically move to the washing and candling areas.
Carton box preparation

- Boxes were preset to have a faster working pace during egg processing.
- This was done using hands of human.
Egg sorting, grading and packaging facility

- Making preparation egg processing using trays of 30 eggs.
- Egg processing is done every Friday per week and processing about 97 stocks of egg.
- Removing all the lamp covering reflectors and washing them.
- Replacing the bulbs that are blown in the broiler house in order to have clearer and better lighting system for the new arrival of the birds.
Broiler house preparation

- The broiler house was replaced with layer of calcium carbonate (marl) to the floor.
- All nipple waterers were checked for leakage and replacing leaking once and feeders were cleaned.
- Proper lighting and ventilation were observed before the arrival of the day old chicks.
- The broiler house was cobwebbed and white washed in order to prevent foul smell and creating clean environment for the growing of birds.
Egg packer machine

- Participating in the cleaning activity of the packer machine room and using blue color code to identify the layer unit.
Making preparation for litter bedding

- The old and existing litter bedding was removed from the broiler house after the usage of six (6) crop of birds for the period.
- The floor was replaced with about 2-3 inches of soil in order for moisture absorption and reducing and or eliminating the buildup of ammonium compound during the housing of birds.
- Rice hull was delivered to the broiler house that will aid the accommodation for the birds, which going to serve as a bedding and also reducing and/or eliminating bird feet cluster.
Feed and water preparation in broiler house

- Paper sheets were placed on the litter to accommodate the feeder trays for day old chicks.
- These paper sheets were removed from the house after the end of three (3) weeks old of the birds.
- Waterers were adjusted for the arrival of the birds.
Arrival of day old chicks in broiler house

- The arrival of the day old chicks in the broiler house.
- Total birds arrived 5,987.
- This total will include class tutorial and lab demonstration.
- Broiler house well equipped with the necessary equipment for creating the ideal temperature and humidity.
Movement of birds in the house

- Birds tend to move closer to the brooding systems searching for warmth.
- Birds are now adopting to their new environment that is conducive for growing.
- Accurate arrangement of water and feeder lines in the house.
Feed sources and water pressure regulator.

- At the end of three (3) weeks the birds are able to consume directly from the feeder lines through an ad lib eating method.
- The water pressure is set below half in the transparent tube on the water regulator.
- The older the birds get, the more feed and water they consume, which increases the feed conversion ratio over the growing period of six (6) weeks for harvest.
Raking and turning the litter

The birds are at three (3) weeks old and the need to rake the litter is very important to prevent the buildup of ammonium compound in the house. The litter in these house locations must be continually stirred, raked or replaced to prevent the problem from becoming worse.
− To obtain maximum broiler production potential, management of the poultry house environment is essential. An important measure of a suitable environment is proper maintenance of poultry litter.
− Both heating and ventilation systems must be continually monitored to ensure that the moisture content of the litter is controlled and the litter remains friable. The sealed litter is often referred to as being "caked." In this condition, the litter is simply saturated with water and the water is unable to escape.
− If litter is not kept at an acceptable level, very high bacterial loads and unsanitary growing conditions may result producing odors (including ammonia), insect problems (particularly flies), soiled feathers, footpad lesions and breast bruises or blisters. In a well-managed broiler house, litter moisture normally averages between 25 to 35 percent. Litter that is managed correctly with the moisture content kept within the acceptable range can be reused if no disease or other production problems occur. On the other hand, caked litter must be removed between flocks and replaced with new litter.
− Bacterial infections caused by *Escherichia coli*, *Camphylobacter jejuni* and *spirochaetes* will also result in wet litter. In addition, several viruses, such as reovirus and adenovirus, have been implicated as causative agents of diarrhea.
Feed driven motor

- Centric motor is used to create a compelling driving force for the shaft to carry the feed to the feeders. The modern broiler house has to provide ideal conditions for the broiler chicken to reach its genetic potential.
- A great deal of investment has been made into improving the broiler chickens through a process of genetic selection.
- The modern chicken grows much faster and has a much better feed conversion rate than 10-20 years ago.
- The downside is that the broiler chicken has to be given ideal conditions or it will not reach its genetic potential.
- Thus the house and its equipment must be designed and constructed to meet the broiler flocks needs as well as the economic needs of the farm.
Display of computer monitor in broiler house

- The computerized monitor controls all the activities that governed the broiler house and also detect any challenge encounter in the house.
Blood sampling on broiler birds

- After the birds reached four (4) weeks, a blood test sampling is done each week.
- Phlebotomy (blood collection) can play an important role in determining the cause of morbidity (sickness) and mortality (death loss) experienced in your flock.
- Three types of blood samples can be used for diagnostic testing: whole blood, plasma, and serum.
- The amount of blood that can be safely collected from a clinically healthy bird is 1% of its body weight, in grams. For example, the maximum amount of blood to take from a 500 g bird is 5 mL (5 cc) of blood. In addition, one should collect less blood from birds that are sick.
Method and technique use of the syringe.

Where Are the Blood Collection Sites?

**The large vein under the wing (brachial vein)**

- Place the bird on a table, setting it on its side.
- Lift up the wing with one hand and part the feathers along the wing. Water can be used to help keep the feathers separated.
- Place the needle at a slight angle, bevel up, against the vein on the underside of the wing. (The bevel is the side of the needle with the angle and the hole.) Insert the needle into the vein and slowly withdraw blood.
- Remove the needle and apply pressure to the vein for a few seconds. This will help to minimize the development of large hematomas, which can be common with poultry.
- Fill the appropriate vial 1/3 to 1/2 of its full volume. Allow the vacuum in the vial to empty the syringe, rather than pushing on the plunger, as this will prevent hemolysis (rupture of red blood cells).
- This volume is needed to ensure enough blood is collected to obtain an adequate sample.
Light is an important aspect of an animal’s environment. Avian species as well as mammalian species respond to light energy in a variety of ways, including growth and reproductive performance.

The value of regulating the photoperiod of poultry and livestock to stimulate reproduction has been recognized for many years and is used regularly by commercial poultry and livestock farmers.

For chickens there are three major functions of light:

1. To facilitate sight.
2. To stimulate internal cycles due to day-length changes.
3. To initiate hormone release. Providing light for chickens has become a little more complex during the last 15 years than just screwing in a bulb and flicking on a switch.
– Now there are a wide variety of lighting programs and devices available to poultry producers, each with its own characteristics and applicability to rearing chickens.
– However, I have found that most people are slightly confused about what light is and what aspects of it are important to rearing poultry.
At the end of each week the birds are weighed to determine the average weight of the flock that will the desired feed conversion ratio.

The method used to weigh birds is by collecting birds from the middle and each end of the house in period.

A very important ingredient in the recipe for a productive broiler breeder flock is the collection of frequent and accurate body weights.

Weighing birds more than once a week will provide rapid feedback on how feed allocations are affecting body weight gains.

When allocating feed, it is important to look at how much the birds have gained in the last few 3-4 day periods and what they need to gain in the next 3-4 day period and beyond.

Weigh the birds when they are placed. It is a good idea to weigh several birds from different parts of the house to get an accurate average body weight.
- Birds weighed on the same day every Friday each week in order, keep the days consistent to simplify the calculations of gains.
- Weigh birds was done from all areas of the barn. Prior to weighing, walk the perimeter of the barn, herding birds away from the walls and feeders towards the area where they will be weighed.
- Ideally, at least 5% of the flock should be weighed. For example, if you have 5000 birds in the barn, weigh at least 250 birds. Weighing more birds will result in a more accurate average body weight.
- A moveable partition was used to enclose 50 to 75 birds into an area at a time. For example, linking six 36" wire frames together into a folding fence was allowed you to create an area in which you can corral 50 or more birds at one time for a short period of time.
- Every bird herded into the enclosure was weighed. Don't leave out heavy or underweight birds unless they are culled.
- The birds were counted as they weighed. An accurate count is one of the most important parts of an accurate flock weight.
- Write the weights and the number of birds down on paper was done. It helps to have a familiar form each time so that recording the information becomes a habit.
- Repeat the weighing process exactly each time. Weigh the birds in the same part of the barn and don't change your weighing technique.
- Once all the birds have been weighed, add up all the weights and divide by the total number of birds that were weighed to get the average body weight.
This weighing cart was used to weigh a total of ten birds at once during their final week.

- Very convenience and accurate.
Final week for birds’ departure.

– Birds arrived at the broiler house on January 16, 2015 and departure on March 1, 2015.
– For that period, the birds were observed two times per day that is from 6-8am and 5-7pm, in order to make changes of improvement.
These houses are equipped with mechanical systems to deliver feed and water to the birds. They have ventilation systems and heaters that function as needed.

- The floor of the house is covered with bedding material consisting of wood chips, rice hulls, or peanut shells. In some cases they can be grown over dry litter or compost.

- Because dry bedding helps maintain flock health, most grow out houses have enclosed watering systems (“nipple drinkers”) which reduce spillage.
- Keeping birds inside a house protects them from predators such as hawks and foxes. Some houses are equipped with curtain walls, which can be rolled up in good weather to admit natural light and fresh air.
- Most grow out houses built in recent years feature “tunnel ventilation,” in which a bank of fans draws fresh air through the house.
Final day for the birds’ departure

- The feeder lines were lifted or raised for zero feed consumption for three (3) hours before the departure of the birds.
Departure of broiler birds

- Broiler birds departed the Cal Poly Poultry house on March 1, 2015 at 10:30pm to the Foster Farm’s processing plant.
- Students from the Animal Science Department assisted in the load out, which took about an hour.
Post load out of broiler house cleaning up.

- The pulverized machine was brought in to refine the litter in the broiler house and the feeders were emptied of used feed.
- Proper preparations were made to for the next upcoming batch of day old chicks.
Conclusion

Creating an internship opportunity for students, provides for “Learn by Doing” experiences that help students develop practical experiences for the future. The vast knowledge obtained at the poultry farm through, production and, procedures processing was an excellent practical experience for the author.
References

California Polytechnic State University
San Luis Obispo

POULTRY CURRICULUM GUIDE

Supervisor: Dr. Bill Kellogg
Candidate: Weston Forbes
Graduate Internship in Agricultural Education
The aim of this project

The development of this poultry curriculum is to provide a guide for students in Jamaica at Grades 7-9 to gain fundamental agricultural concepts through hands-on experiences, by related knowledge and attitudes, which are transferrable to upper-school or out-of-school situations. Through the processes involved in conceptualizing, designing, implementing and evaluating agricultural projects, the students engage available resources in creative ways to find solutions, while striving to protect and/or enhance their environment. Mindful of their peer, teachers, and other stakeholders, individual students seek to emphasize safety and hygienic practices in pursuit of competencies in areas such as, leadership, healthy lifestyles, character building, volunteerism, self-confidence, self-actualization, and proud citizens.

This Project-based approach is to develop and implement agricultural projects that will give the student an insight into the role of agriculture in national, regional and international economies, the diversification of agricultural enterprises, the important role of agriculture, as well as, the realization that all normal humans must interact meaningfully with some form of agricultural outputs.

There is a rapid growth and social changes in the school’s community, as it relates to poultry production and management. The students and their family members are now using the poultry production and management as a business enterprise, so to elevate their socio-economic pattern in order to survive in today’s world.

I use this initiative to develop the poultry curriculum to ensure that young people (students) are well prepared for the challenges and opportunities they will meet as adults in the society they are living. It is said that human knowledge is increasing rapidly and of such change, it is commendable for developing this curriculum, so as to prepare my students not just for today, but for the changing future.

Most of the school’s enrollment population is surrounded by a farming community for a living, which lends itself through theatrical and practical orient of learning from this curriculum being developed. From this approach, it is very important for the students to be rooted in their own culture and play an active and responsible role as vibrant students during their tenure.
They should also be aware of their position as global citizens in an increasingly inter-connected and inter-dependent world, so the students need to grow in confidence to face the challenges ahead of them, so they can become successful life-long learners to enable them to operate effectively and efficiently in a rapidly changing knowledge economy.

This curriculum will be instrumental in imparting appropriate farming practices akin to 21st century global and scientific studies. This is important in order to ensure that students are exposed to adequately to realize the real gains from farming as a profession.

They should also be aware of their position as global citizens in an increasingly inter-connected and inter-dependent world, so the students need to grow in confidence to face the challenges ahead of them, so they can become successful life-long learners to enable them to operate effectively and efficiently in a rapidly changing knowledge economy.
AIM OF RESOURCE AND TECHNOLOGY

The study of this poultry curriculum development will enable students to become:

• Critical thinkers and problem solvers
• Confident, responsible and productive students
• Adaptable to changes in the world around them
• Aware of range of career options

CONTENT OUTLINE FOR GRADES 7-9 POULTRY CURRICULUM DEVELOPMENT PROJECT.

Introduction to farm animals

• Animals and their economic importance of:
  - Leisure
  - Food
  - Security & Companion
  - Clothing
  - Medicine
  - Power
  - Raw materials for industries

Classification of animals

• Vertebrates and invertebrates
• Species and Breeds of animals
• Classification of farm animals based on types and purposes for which they are reared
  - cattle – beef, dairy
  - goats – meats, milk
  - poultry – meat, egg
  - pigs – meat
• Traits of some common farm animals

Resources required for rearing farm animals:

• Time
• Technical skills
• Housing/shelter
• Feed and water
• Specialized equipment
• Money

Growing of poultry birds

• Prepare a basic income and expenditure budget
• Housing requirement:
  - Protection
  - Ventilation
  - Adequate space
• Materials and equipment required:
  - feeders
  - waterers
  - brooder
  - litter
  - feed
  - baby chicks
  - medication
• Prepare house, tools and equipment for poultry
• Prepare the brooding area
• Grow out processes
• Evaluation of project outcome against project goals

Classification of Resources Used in Growing Poultry

• Human Resources
  Definition of human resources
  Importance of human resources in agriculture
  Identify key personnel in poultry production processes
  Some key careers in the poultry industry
  Educational requirements for selected jobs in poultry production
  Classification of Non-human Resources used in poultry production

Natural Resources and Man-made Resources

- Natural Resources used in broiler production
- Man-made Resources used in broiler production
System Integration of Poultry Rearing

Will able to assess students through:

- Knowledge and Skills required to rear poultry birds successfully in the following subject areas:

**Science**

- Economic importance of animals
- Vertebrates and invertebrates and their importance to agriculture
- Classification of animals based on purpose for which they are reared; age, sex.
- Nutrients supplied in a typical feed for poultry birds.
- Importance of environmental conditions to the performance of animals:
  1. Temperature
  2. Ventilation
  3. Moisture

**Mathematics**

- Space requirements for a given number of birds calculated.
- Resources required for a given number of broiler birds from day old to market (live) calculated:
  - Brooder
  - Feed and feeders;
  - Water and waterers
  - Medication
  - Electricity
  - Medication
  - Litter
- Measurement of input resources and products, temperature
- Development of basic budget
- Creation of activity schedule based on established standards.
- Records used to carry out appropriate analyses.
**Technology**

- Competence developed in the use of simple and advance technology in growing poultry birds, to include systems for:
  - Heating
  - Watering
  - Feeding
  - Ventilating
  - Lighting
- Skills and processes in poultry production, to include:
  Measuring, calculating, feeding, watering, heating, maintaining litter, ventilating, managing temperature, medicating, marketing.

**Design Process**

- Identification of problem to be solved
- Problem statement created
- Design process implemented
- Birds that are grown for meat and egg
- Reasons for broilers being preferred birds for meat
- Ideas for solving problem generated
- Resources used/available for growing poultry birds
- Idea(s) of possible solution selected
- Possible growing schedule
- Plan of activities developed to test selected solution(s)
- Poultry grown observing industry standards and project design
- Outcome of the project evaluated
- Presentation of results
Range and Content

Students will develop key concepts and skills by learning:

- To select and group farm animals
- Design projects to grow given numbers of broiler birds from day one to readiness for slaughter, in different scenarios
- Design projects to grow given numbers of layer birds from day one to egg production maturity
- To clean the house in readiness for broiler/layer production
- To set up and manage the brooding area and process
- To manage birds after the brooding process
- To manage health and sanitation

Students will develop key knowledge, understanding and attitudes by learning:

- What are broiler and layer birds and why are they reared?
- The economic importance of farm animals
- Types and purposes of poultry (broiler birds and layer birds)
- The basic role of animal protein in the human diet
- Basic requirements of housing, tools and equipment needed for broiler and layer production
- Essential principles and practices for growing broilers and layers

Students will practice important values through:

- Valuing original ideas, demonstrating enterprise and innovation
- Friendship, care, compassion, cooperation, acceptance, belonging, sharing
- Developing self-confidence, optimism, perseverance, well-being
- Attain success, pursuing excellence
- Acting honestly, ethically, consistently
- Developing tolerance, respecting differences, encouraging diversity
Students will learn about:

• The importance of broiler and layer birds to the human diet
• Designing a programme for rearing broiler birds
• Designing a programme for rearing layer birds
• Selecting and using appropriate resources
• Day-to-day management of broiler birds
• Day-to-day management of layer birds
• The structure of the digestive system of a bird to its function
• The structure of the parts of an egg to its function
• Essential nutrients for maximum poultry growth and development
• Appropriate rations for each stage of growth for broilers and layers
• The feed conversion ratio calculation
• The importance of the feed conversion ratio
• The housing and space requirements for broiler and layer birds
  • Managing the environment and resources to ensure health and safety of the birds (and humans)
• Managing the economics of rearing broilers
• Creating and using records to evaluate performance of the project against established goals.
GUIDANCE FOR THE TEACHER

- Planning and preparation are critical factors to delivering this programme
- Research local, national, regional, and international importance of broiler production
- Apply Agricultural Business principles and practices to this project
- Establish student groups that facilitate organizational structure, teamwork, and scheduling of duties
- Procure suitable and adequate resource in a timely manner
- Where possible, ensure sufficient scale of the projects that allow for reasonable marketing potential
- Arrangements should be made to have the grown broilers processed for meat
- Organize market for the output of the broiler and layer projects
- Resources should include those for models of broiler and egg production facilities
- Promote/reward the observance of practices which sustain and/or enhance the environment
- Promote a culture of technically-sound agricultural practices
- Deliberately promote the linkages between agriculture and other curriculum offerings.
The Attainment Target

STRANDS 1: Creativity & Innovation
Students will be able to apply creativity and innovation in the solution of problems to explore a range of problem solving contexts and develop ideas for solutions utilizing new technologies.

STRANDS 2: Exploring Methods and Procedures
Students will be able to Explore Methods & Procedures in solving problems, in order to use the design process in planning and execution of solution for an identified project.

STRANDS 3: Applying Solutions
Students will be able to apply appropriate strategies in finding solutions to identify needs to operate tools and equipment with increasing competency and appropriate safety and hygiene consideration.

STRANDS 4: Career Pathways
Students will developed awareness of a range of career pathways to build skills relevant to the world of work and the areas of occupational interest.
Objectives of Target 1:
• Identify the types of layer and broiler birds.
• Identify and examine the structure and functions of the digestive systems of the birds.

Target 1:
Students will be able to distinguish between broiler and layer and complete Feed Conversion Ratio for birds.
• Identify nutrient sources
• Explain balanced ration
• Calculate feed conversion ratio

Objectives of Target 2:
• Explore methods and procedures for effective rearing of broiler and layer birds.
• Create designs of broiler and layer growing facilities.

Target 2:
Students will be able to explore methods & procedures in developing and determining from a range of options the design and the plans to rear broiler and layer birds.
• Explore methods and procedures for effective rearing of broiler and layer birds
• Create electronic designs of broiler growing and egg production facilities.

Objectives of Target 3:
• Apply design solutions and principles in rearing broiler and layer birds.
• Create computer graphics, spreadsheets, and other documents related to the broiler and layer projects.

Target 3:
Students will be able to apply solutions in rearing layer and broilers birds through the application of the design principles and basic broiler and layer growing principles and practices.
• Apply design solutions and principles in rearing broiler and layer birds
• Create spreadsheets and other documents related to the broiler and layer projects.
Objectives of Target 4:
• Create and apply design principles to rear broiler and layer birds.
• Research systems/methods of broiler and layer production online.

Target 4:
Students will be able to demonstrate awareness of a range of career pathways related to rearing poultry, which include direct agriculture-based careers/occupations, as well as, careers/occupations associated with the supply of goods and services
• Develop an awareness of career pathways related to rearing broiler and layer birds
• Research related careers online and in storage devices
Introduction to the Project

Teaching and Learning Activities
Students will have the ability to create an assessment using key skills to:

• Research the economic importance of poultry birds
• Identify animals grown in their communities and group them according to economic importance.
• Discuss vertebrates and invertebrates and identify the importance of each group to agriculture
• Compile a scrapbook of vertebrates and invertebrates that are of economic importance to agriculture, including brief description of the importance of each.
• Classify animals based on:
  Purpose for which they are reared
• Age and sex Classify animals
• Animals classified correctly based on the purposes for which they are reared.
• List created of common invertebrates that are of economic importance to agriculture.
• Animals are classified correctly based on:
  1. Species
  2. Breeds
  3. Age and sex
Project Design

Teaching and Learning Activities

Students will:
• Research the various types of structures used to house broilers and layers.
• Discuss characteristics of a good poultry house
• Evaluate available housing and equipment for broiler and layer birds.
• Determine the number of broilers and layers to be grown
• Determine resources required for a given number of birds
• Prepare a basic income and expenditure budget
• Develop soft/hard flow-chart of the schedule of activities for the rearing of broiler and layer birds
• Calculate the number of feeders and waters needed for grow out of birds
• Calculate the floor space required to rear birds to slaughter
• Calculate feed and water need for the birds
• Determine housing requirements for rearing broiler and layer birds
• Prepare a simple meat and egg production budget
• Create relevant recordkeeping forms
• Perform appropriate computation/calculation in broiler and egg production.
• Floor space required for a given number of birds calculated
• Resources required for given production situation calculated
• Flow chart portrays evidence of process involved in rearing broiler and layer birds.
Project Implementation

Teaching and Learning Activities
Students will:
Practice the importance of clean, comfortable environment to profitable broiler production, including:

• Remove ‘old’ litter
• Wash and disinfect floors and walls
• Wash and disinfect drop curtain
• Whitewash walls
• Remove and clean curtain
• Clean floor, walls and mesh to include removal of cobweb
• Clean feeders, waterers, and brooder
• Install brooding ring and litter
• Install functional heat source
• Calculate number of waterers and feeders to be used
• Install waterers and feeders and drop curtains
• Prepare foot bath
• Start recordkeeping
• Use spreadsheet to design simple record template for broiler Production.
• Maintain accurate recordkeeping
• Remove brooding ring (as applicable)
• Distribute and install feeders and waterers according to industry standards.
• Select feed form for appropriate age of birds (crumble and pellet)
• Basic interpretation of the feed label
• Manage the house litter
• Adjust feeders and waterers according to industry standards
• Manage temperature and ventilation
• Monitor sanitation and hygiene of the growing environment
• Weigh birds throughout the growing period
• Insist on the use of the footbath and its purpose
• Recharge footbath daily
• keep litter loose and absorbent
• Maintain sanitation of feeders and waterers
• Monitor visitors to poultry house
• Institute rodent and wild-birds control measure
• Cull birds according to enterprise standards
• Dispose of dead or culled birds according to industry and enterprise standards
• Prepare existing facilities to grow broiler birds
• Keep accurate records
• Maintain a clean and efficient workplace
• Work safely and maintain a safe workplace
• Work as a team
• Plan and manage time
• Operate equipment safely
• Clean and store equipment
• House for broiler production cleaned according to instructions to the required standards
• Materials suitable for use as litter for broiler production are identified, and the use of such materials justified
• Litter in brooding-area/poultry house spread to the correct depth
• Waterers and feeders installed/adjusted according to industry standards.
• Requirements for given number of birds calculated
• Feed use and feed conversion ratio calculated using records
• Research careers related to poultry production
• Create a scrapbook of careers related to the poultry industry
• Develop flowcharts showing the educational pathways to identify careers in the poultry industry.
• Create a ‘Rich Picture’ showing occupations and careers associated with the production of broiler and layer.
• Research on careers related to the poultry industry evidenced
Evaluation of Project

Possible Assessment of students to:

- Use records to determine number of birds that died during the rearing process and calculate mortality rate.
- Use weight-gain records to determine period of maximum growth.
- Use records to calculate period of maximum feed conversion.
- Evaluate performance of batch against established goals or industry standards.
- Use budget projections and actual income and expenditure to determine success of project.
- Calculate profit and loss and perform basic Cost Analyses.
- Develop and present end-of-project report.
- Maximum growth rate determined using records.
- Period of maximum feed conversion calculated using records.
- Flock/batch performance established using industry standards.
- Success of project determined by comparing projected and actual income and expenditure.
Learning Outcomes

Students will be able to:

- Classify common animals into vertebrate and invertebrates
- Identify some common vertebrate and invertebrates used for human food
- List and give examples of vertebrate and invertebrates that are of agricultural importance
- Outline the basic characteristics of mammal, birds, fish
- Identify classes of animals and define or describe members of each class
- Classify farm animals based on age and sex
- Explain at least five (5) key terms which are fundamental to the growing of broiler and layer birds
- Design a project to grow broiler and layer birds
- Demonstrate a knowledge of the housing requirements for broiler and layer birds
- Identify/select resources to prepare broiler and layer houses for production
- Prepare the house and equipment to grow broiler and layer birds
- Prepare for the arrival of day-old broiler chicks
- Maintain sanitation/hygiene in the broiler and layer houses
- Manage temperature and ventilation for growing broilers
- Install and manage the brooding area
- Manage the post-brooding processes of growing broiler birds
Points to Note

1. Students must be made aware of health & safety issues in connection with this project at the commencement of the teaching and learning activities.
2. Safety of students and environment must be emphasized at every stage of the project.
3. Students should be encouraged to explore and develop solutions to challenges encountered in the project.
Extended Learning:

1. The students may be made to work as established groups/teams.
2. Students can use methods learned by applying them to future development of agriculture enterprises to provide income, individual livelihood and employment for others in the agriculture field of their community.
3. The development of skills and better appreciation on the areas that may be enhanced by the following:
   - Field trips
   - Research projects
   - Visits from resource personnel from poultry farms
   - Home poultry rearing/projects
Resources and Key Vocabulary

Capital, input, land or location, labour, market, resource personnel

- Record sheet
- Feeders
- Waterers
- Brooder
- Litter
- Poultry house
- Computer
- Baby chicks
- Feed
- Scale
- Light
- Water
- Medication
- Charts
- Pictures
- Videos
- Models
- Texts
- Spreadsheet/word processing software
- Rake or hay pork
- Broiler
- Litter
- Brooder
- Drop curtains
- Good sanitation
- Ration
- Feeders
- Brooding
- Foot Bath
- Crumble
- Pellets
Links to other subjects:

- Biology and Integrated Science: Classification of animals
- Visual Arts: design principles (layout, labels)
- ICT: create spreadsheet, labels, flow chart, graphs,
- Business Basics: create a simple budget, planning
- Mathematics: measure, calculate, weigh,
- English Language: research, document, report
- Science: sanitation and hygiene, classifying foods, classifying living and non-living things
- Social Studies: production and consumption of goods and Services.
References

1. CXC Agriculture Revision Course, by Sahadeo Ragoonanan.
California Polytechnic State University
San Luis Obispo

Unit Plan for Poultry Curriculum Guide

Supervisor: Dr. Bill Kellogg
Candidate: Weston Forbes
Graduate Internship in Agricultural Education
<table>
<thead>
<tr>
<th>Topic</th>
<th>Duration</th>
<th>Objectives</th>
<th>Teacher Presentation and Materials/Equipment</th>
<th>Students Activities/ Assignments</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type and purpose of Poultry birds</td>
<td>90 minutes</td>
<td>• Students will be able to list and state the purpose of poultry rearing.</td>
<td>• Use of Power point presentation&lt;br&gt; • Handouts</td>
<td>I. Designing a program for rearing poultry birds.&lt;br&gt;II. Identifying breeds poultry birds.&lt;br&gt;III. Purpose for which they are reared.&lt;br&gt;IV. Select group poultry farm animals.</td>
<td>• Written quiz by instructor.</td>
</tr>
<tr>
<td>Topic</td>
<td>Duration</td>
<td>Objectives</td>
<td>Teacher Presentation and Materials Equipment</td>
<td>Students Activities / Assignments</td>
<td>Evaluation</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>----------</td>
<td>----------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Economic importance of poultry rearing    | 90       minutes | • Students will be able to state the economical importance of poultry rearing for food. | • Use of Power point presentation • Handouts • Notes from textbooks | I. Research the economic importance of poultry birds.  
II. Identify types of poultry grown in their communities and group them according to the economic importance.  
III. List common invertebrates that are of economic importance to agriculture.  
IV. Prepare a basic income and expenditure budget.  
V. Complete a scrapbook of vertebrates and invertebrates that are of economic importance to agriculture, including brief description of the importance of them.  
VI. Provide appropriate computation/calculation in boiler and egg production.  
VII. Create relevant recordkeeping forms. | • Teacher will create a scoring rubric for grading students’ scrapbook. |
<table>
<thead>
<tr>
<th>Topic</th>
<th>Duration</th>
<th>Objectives</th>
<th>Teacher Presentation and Materials/Equipment</th>
<th>Students Activities/Assignments</th>
<th>Evaluation</th>
</tr>
</thead>
</table>
| Role of poultry protein to human body | 90 minutes     | • Students will be able to carry out a test for the presence of proteins using laboratory materials, observation and conclusion. | • Laboratory equipment – Field Tools – Materials  
• Simple Balances ( scales) – Chemicals – Measuring equipment | I. Complete laboratory exercise report.                                          | • Score and record students’ lab report.                                    |
<table>
<thead>
<tr>
<th>Topic</th>
<th>Duration</th>
<th>Objectives</th>
<th>Teacher Presentation and Materials/Equipment</th>
<th>Students Activities/ Assignments</th>
<th>Evaluation</th>
</tr>
</thead>
</table>
| Establishment of poultry house     | 90 minutes | ● Students will be able to discuss the characteristics of a good poultry house. | ● Charts and Diagrams ● Handouts ● Overhead Projector | I. Research the various types of structures to house boiler and layer birds.  
II. Determine the number of boilers and layer birds to be grown in a specific house size and floor spaces.  
III. Determine resources required for a grown number of boiler and layer birds.  
IV. Develop soft/hard flow chart of the schedule of activities for the rearing of boiler and layer birds.  
V. Calculate the number of feeders and waterers needed for growing birds.  
VI. Flow charts portray evidence of process | ● Teacher will create written and oral quizzes and assess students’ practical work using designed scoring rubric. |
<p>| VII. | Evaluate available housing and equipments for boiler and layer birds. | involved in boiler and layer birds. |</p>
<table>
<thead>
<tr>
<th>Topic</th>
<th>Duration</th>
<th>Objectives</th>
<th>Teacher Presentation and Materials/Equipment</th>
<th>Students Activities/Assignments</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential Principles and Practices of poultry birds.</td>
<td>90 minutes</td>
<td>• Students will be able to demonstrate the principles and practices of rearing of poultry birds.</td>
<td>• Use of overhead projectors • Charts and diagrams • Handouts</td>
<td>I. Practice the importance of clean, comfortable environment to profitable boiler and layer production. Include some of the following: II. Use of spreadsheet to design simple record template for boiler and layer production. III. Wash and disinfect floors and white wash walls. Maintaining foot bath and accurate recordkeeping.</td>
<td>• Teacher will provide feedback to students during farm practice schedule.</td>
</tr>
<tr>
<td>V.</td>
<td>Work safely, maintain a safe workplace and work as a team.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Duration</td>
<td>Objectives</td>
<td>Teacher Presentation and Materials/Equipment</td>
<td>Students Activities/ Assignments</td>
<td>Evaluation</td>
</tr>
<tr>
<td>------------------------------------------------------------</td>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>History of poultry management and poultry production.</td>
<td>90 minutes</td>
<td>• Students will be able to appreciate the history of poultry management and production.</td>
<td>• Use of overhead projectors&lt;br&gt;• Charts and diagrams&lt;br&gt;• Handouts&lt;br&gt;• Multimedia projector</td>
<td>I. Research careers related to poultry production.&lt;br&gt;II. Create a scrapbook of careers related to the poultry industry.&lt;br&gt;III. Develop flow charts showing the educational pathways to identify careers associated with the production of boiler and layer.&lt;br&gt;IV. Research on careers related to the poultry industry.&lt;br&gt;V. Litter in breading area/poultry house spread to the correct depth.&lt;br&gt;VI. House for boiler production cleaned according to the instructions to the required standards.&lt;br&gt;VII. Calculate space requirement for</td>
<td>• Teacher will provide feedback to students during farm practice and also an oral and written test.</td>
</tr>
<tr>
<td>VIII.</td>
<td>Calculate feed use and feed conversion ratio using records.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IX.</td>
<td>Calculate the mortality rate to determine the number of birds that died during the rearing process.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>