

Book

2



Year

9



**Agricultural
Science**

Agricultural Science

Year 9 Book Two



**GOVERNMENT OF SAMOA
DEPARTMENT OF EDUCATION**

Acknowledgements

The Department of Education would like to thank the following writers for their vision, patience and hard work in putting together this valuable book.

Ms Laisene Samuclu

Ms Masa Faasau

Ms Sue Margolis

Mr Frazer Taitin

Mr Tolo Josefa

Mr Hofeni Ah Voa

Mr Gauna Wong

Material produced at the Curriculum Development Unit of the Department of Education as part of the Samoa Secondary Education Curriculum and Resources Project.

Funded by the New Zealand Ministry of Foreign Affairs and Trade under New Zealand's Official Development Assistance Programme.

Managing Contractor: Education and Development for Asia and the Pacific.

© Government of Samoa Department of Education 2001.

TABLE OF CONTENTS

Unit	Title	Page
Strand 3	Management, economics and marketing	5
		5
2	Record keeping	9
3	Economic concepts	15
4	Marketing fresh produce	21
Strand 4	Animal production	27
5	The Importance of animal production	27
6	Chicken products and raising systems	34
7	Handling chickens	42
8	Management of reproduction and growth	49
9	Management of animal health	61
10	Management of nutrition and feeding	68
	Glossary	81

Unit 1: MANAGEMENT OF RESOURCES

Objectives

At the end of this unit you should be able to:

1. Define the term *management*.
2. List four types of *resources* that need to be managed.
3. Explain the role of a *farm manager*.
4. Explain why a practical knowledge of farm management is important in farming.

Introductory Questions

1. What does the term *management* mean?
2. If you are thinking of starting a farm, what important factors will you consider in your planning?
3. How will you ensure that your project becomes successful and profitable?

Background Information

Management refers to the effective use and controlled use of available resources in order to make an enterprise profitable. The common resources to be managed in a farm are land, labour, capital and technology. Making plans and using resources successfully to grow cash crops or to raise animals to sell is called farm management.

Farm management involves:

- Finding out what people want to buy.
- Deciding on the type of crops to be grown or animals to be raised.
- Planning a budget for the enterprise.
- Finding necessary capital to meet the farm's needs.
- Arranging the land and facilities.
- Organising labour and equipment.
- Ensuring the efficient running of the enterprise by the owner or manager.

Technology is using new ideas or new methods to increase production. *Management* is the ability or skill to organise and control resources.

The correct use of *resources* will help the farmer to optimise production in a more satisfying and profitable way.

ACTIVITY A**Farm Resource Investigation****Materials/Equipment**

- No equipment needed for this activity.

Instructions

In this activity you are going to investigate a farm close to your school.

During the visit:

1. Find out what the farm objectives are.
2. List all the resources you can identify on the farm.
3. Find out how the farmer allocates his resources.

Using the table below:

1. Group the farm resources under the basic resource groups.
2. After the farm visit divide into groups of five.
3. Discuss and reallocate the available resources to meet farm objectives.
4. Present your group's recommendations to the class for discussion.

Type of Farm:	Resources Under Each Group
Basic Resource Groups	
Land	
Labour	
Capital	
Technology	
Inputs	

ACTIVITY B**Resource Management****Instructions**

In this activity you are given a management problem for which you will have to find a solution. You need to read through the case study in order to understand the situation.

1. Read the case study.
2. Divide into groups of three students.
3. Discuss the case study and answer the discussion questions that follow.

DISCUSSION QUESTIONS

1. What type of resources does Mr Johns have?
2. If you were the farmer, which crop would you grow on a large scale? Discuss and provide reasons for your choice.
3. What management decisions would you make?

Case Study:

Mr Tom Johns has 20 hectares of land of which 4 hectares are too steep for cultivation. Tom decides to plant banana and taamu on the rest of the land. He has a family of seven and has a well trusted source of labour for his farm. There are problems that he faces. First he does not have starting capital to buy chemicals for his crops. Secondly, he does not have the knowhow to grow these crops. Thirdly, he is not sure which of the two crops he should grow on a larger scale. He knows that farmers get \$20 for a bunch of bananas and \$10 for taamu. He also knows that he needs to buy chemicals for his bananas in order for them to produce good bunches, whereas, for taamu, pests and disease are not a problem at all.

FOLLOW-UP QUESTIONS

1. Does the farmer have adequate resources to meet farm objectives?
2. Is the farmer allocating his resources in the best possible way?
3. How can the farmer reallocate his resources to meet the farm objectives?
4. On what factors will the farmer base his/her decisions?
5. What other resources does the farmer need?

Review

1. Define the term "farm management".
2. Briefly describe the importance of the following:
 - Land management.
 - Financial management.
 - Labour management.
 - Technology.
 - Record-keeping.
 - Decisionmaking and planning.

True or False

In your workbook write either **True** if the statement is true or **False** if the statement is not true.

1. _____ Labour and Capital are the key resources for success in farm business.
2. _____ The main aim of any farm manager is to make a profit.
3. _____ The function of a farm manager is to organise resources, make decisions and implement plans.

If you have a 20m x 20m piece of land, plan how you would best utilise the area by trying to answer the following questions:

1. What are the farm's objectives?
2. What to produce?
3. How to produce?
4. How much to produce?

Unit 2: RECORD-KEEPING

Objectives

At the end of this unit you should be able to:

1. Explain the importance of record-keeping.
2. Interpret records.
3. Keep accurate records.

Introductory Questions

1. Why does a teacher always keep a record of student attendance?
2. Why does a teacher keep a record of his/her student marks?
3. Why does a shopkeeper keep a record of purchases and sales and regularly check his/her stock?
4. Do you keep any kind of record at home?
5. Why are records necessary for a business?

Background Information

Records are sets of information which are collected and stored for decision-making and planning. Record-keeping is a system of recording information on what is happening in an enterprise on a daily basis.

Good records are necessary for:

- Good credit relations.
- Sound credit planning.
- Business continuity.
- Budgeting.
- Enterprise analysis.

There are four major types of records:

- Financial records.
- Inventory records.
- Production records.
- Labour records.

Financial Records

Financial records deal with income or revenue and expenses of a business. These records list all income and expenses by date, such as purchase of

UNIT 2

tools, planting material, fertilisers and sales. An example of a simple farm financial record sheet is given below.

Financial Record Sheet							
Date	Expenses			Income			Comments
	Item description	Value (Tala)	Receipt number	Item description	Value (Tala)	Receipt number	
January							
2/1/00	• 2kg tomato seeds@ \$10/kg - Molesi. • Stall fee market.	\$20.00 \$5.00	72466 250198	Sale of Cabbage at Apia market - \$2/ bundle (50 bundles).	\$100.00	-	Price of Cabbage increased from \$1 yesterday to \$2 today.
3/1/00							
31/1/00							
January Total							
February							

Inventory Records

This includes a list of items or assets owned by the farmer from the beginning till the end of the farmer's operation of the farm. Inventories are usually taken once a year. Farmers normally do stocktakes at the end of every month. An example of an inventory record sheet is given below.

Inventory Record Sheet							
Date	Description						Comments
	Item	Total	Registration Number	Model	Year	Value	
31/1/00	1. Tractor	1	13224	250 Massey Ferguson	1999	T\$40 000	Stock-take on January 31, 2000
	2. Bush Knives	10	555	Sharp	1998	T\$200	All in good condition
	3.						
	4.						
	5.						
	6.						
	Total						
28/2/00							Stock-take on February 28, 2000

Production Records

These records deal with the operation of the enterprise. They include quantities of output and resources used e.g., animals produced, weight gain/day, yield/acre and fertiliser/pesticide application rates. Some examples are:

- Crop records.
- Livestock records.
- Machinery maintenance records.
- Marketing records.
- Labour records.

Crop Records

A crop record should include details of the crops grown in each plot, the dates of planting and harvesting, the amount of seeds, chemicals and fertiliser used and yields. A sample is given below.

Plot number: 4 Soil Type: Clay loam (pH-5.5) Area: 0.3 hectares							
Crop	Date of soil preparation	Date of planting	Spacing	Date of fertiliser application	Date of weeding	Date of harvest	Yield(kg)
Dwarf beans	4/7/00	7/7/00 - 0.5 kg seeds	60x30cm	7/7/00 - NPK (5kg)	8/7/00 - hand weeding	4/10/00	60
Banana							

Livestock Records

Large scale livestock farms require good record-keeping. Such records are important for checking on births, deaths, theft, feeding, identification, stock numbers and breeding. An example of a record sheet for layers is shown below.

Animal: Layers – White leghorn Batch: 5 Date new batch introduced: 6/5/00 Age of Layers : 10 weeks Raising system : Deep litter							
Date	Number at start	Feed per day	Water	Deaths	Medication	Eggs laid	Grade
6/5/00	500	10kg – Layer mash	2 litres	nil	nil	200	Jumbo - 20 Medium -100 Small -75
7/5/00							

Labour Records

These records account for time spent by employees and wages paid. It is useful to keep a record of the hours and type of work done similar to the one below.

Weekly Time Sheet.						
Name:						
Day	Enterprise	Plot No	Activity	Hours	Pay/day	Total pay
Monday	Talo	1	Weeding	2		
Tuesday	Banana	2	Weeding	3		
Wednesday	Yam	5	Fertilising	1		
Thursday	Coconut	6	Collection	2		
Friday	Vegetables	1	Harvesting	1		

From such records we can check on the progress of work. All available records must be accurate and complete. One way of making sure that records are accurate is to write the information soon after observing an operation or activity. If possible, records should be kept regularly. The whole purpose of keeping records and accounts is to manage the farm efficiently. We can make use of our records to compare results with previous years or with other farmers. By comparing results and discussing problems with others we can improve management and production.

Proper record-keeping will help us to:

- Make decisions on farm operations e.g., on what, when and how much to produce.
- To evaluate the profitability and determine whether it is worthwhile to continue or make necessary adjustments.
- To compare with previous years' performance standards, for example, to know the efficiency of each stage in production, such as weaning pigs and feeding them out.
- To know the amount of income, expenses, profits or losses due to other factors such as pests and diseases.
- To provide basic information for future budgeting for an enterprise.
- To keep an account of funds used.
- To determine resource needs and limitations.
- To provide information for research and development.

ACTIVITY A**Interpreting Records****Materials/Equipment**

- No equipment needed for this activity.

Instructions

- Divide into groups of three or four.
- Study and discuss the broiler record sheet given below.
- Discuss and answer the questions that follow.

Introductory Questions

- How is the total number of good eggs calculated?
- Explain how the number of graded eggs are determined.
- How often should eggs be collected?
- Give three important types of information that are not included in the record sheet.
- Discuss and redesign the record sheet so that it is easy for you to understand.
- Present your group's new format to the class.

Record Sheet - Broiler Chickens

Batch number: _____

Batch Total: _____

Date Introduced: _____

Date	Total eggs collected	Total broken eggs	Total good eggs	Grade of Eggs				Comments
				Jumbo	Large	Medium	Small	

ACTIVITY B**Taking Records of Chickens at Home****Materials/Equipment**

- You will do this activity with a friend at home.

Instructions

- Copy the table on the following page into your exercise books.
- When feeding your chickens* at home, record the information asked for in the table.

*If you do not have any chickens, observe and record your neighbour's or relative's chickens.

Date:		
Type of Chicken	Identification (feather, wattle, comb, shank, colour and shape)	Number
Rooster		
Hen		
Pullets		
Chicks		
Total		

ACTIVITY C**Materials/Equipment**

- No equipment needed for this activity.

FOLLOW-UP QUESTIONS

- Why is it important for farmers to keep records?
- How often do farmers have to keep records?
- What type of records do poultry farmers have to keep?

Field Visit

In this activity you will visit a livestock or crop farm near the school and take records. You may need to ask the farmer for information you require in your records.

Instructions

- Arrange a few students to give the introductions and vote of thanks (a roster can be developed for the class so that all students have a turn on other visits).
- Divide into groups of three or four.
- Carefully study the/a farm enterprise, e.g., pigs or banana plantation.
- Discuss and take records of what you observed and the information you received from the farmer.
- Use the following examples of enterprise record sheets to record the information you collect. You may need to modify the record sheets to suit the enterprise from which you are collecting records.

Review

- With your partner discuss, design and draw up a simple, easy to follow record sheet/card for layer birds.
- Present it to your class for discussion.

Unit 3: ECONOMIC CONCEPTS

Objectives

At the end of this unit you should be able to:

1. Define what *agricultural economics* is.
2. Define the terms *scarcity*, *choice*, *demand*, *supply*, *price* and *opportunity cost*.
3. Use diagrams to explain the interaction between *supply* and *demand* and how they affect price.
4. Explain how *income* affects *demand*.
5. Discuss the factors that determine a buyer's *choices*.
6. Determine *resources* that are needed to produce a commodity.

Introductory Questions

1. What is economics all about?
2. Are there always enough resources to meet your needs? Explain.
3. What determines the price of goods sold in a market place?
4. What do you look for when you buy goods?

Background Information

Agricultural economics is applied social science. It deals with how we choose to use technical knowledge and resources such as land, labour, capital and management to produce food and fiber. It also looks at how we distribute food and fiber for consumption to various members of society over time. Agricultural economics therefore uses scientific method and economic theory to find answers to problems in agriculture.

The ability of the farmer to grow plants and animals is not enough to make him/her successful. He/she needs to know how to manage a farm and how to select and handle crops and livestock and the costs involved. The farmer needs to understand terms such as scarcity, choice, demand, supply, price and opportunity cost.

Scarcity is a universal condition a good or service is in; caused by the relationship between the amounts of things (e.g., taro) available (i.e. supply) and the amounts desired (i.e. demand). A good or service is scarce when we must give up (sacrifice) some amount of one thing (e.g., taro) to get another (e.g., ta'amu). The moment we realize that a valued good or service is being sacrificed so as to gain something else, we become aware of the economic meaning of the word cost.

As we make our choices in the face of scarcity, opportunity costs are generated.

Opportunity costs constitute the value of alternative opportunities forgone or sacrificed. When you choose between growing your own tomatoes at home and buying them from the market, there is an opportunity cost involved. Sometimes a working mother can be too busy to grow vegetables for the family, so she opts to buy them from the market. If for a week she spends \$20.00 on vegetables, she is sacrificing this money so she can rest at home in the evenings instead of having to be in the garden, weeding and planting.

Another example is when your mother decides to send the washing to the laundromat where she will pay \$15.00 for five loads. She chooses to spend \$15.00 and saves herself from sitting at the tap, hand-washing for a whole day. She sacrificed her money for a good rest and also to save time because at the laundromat the washing will only take 2 hours or less.

Choice may be defined as the opportunity or power of choosing.

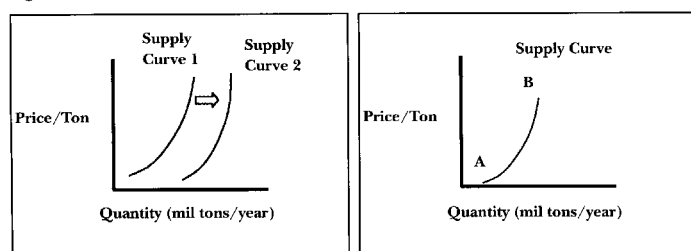
Supply is the amount of goods, services, or products for sale at a given time.

These factors affect supply:

- Technology of production (way the goods are produced).
- Prices of inputs used in production.
- Prices of products that may be substituted in production.
- Number of sellers in market.

For example a new technology that lowers the cost of production will shift the supply curve from 1 to 2 (Figure One) while an increase in the price of product or good will effect a move from A to B and an increase in quantity supplied (Figure Two).

Figure One: Shift from Curve 1 to Curve 2. Figure Two: Shift from Point A to Point B.



When the supply is low, the price is high and when the supply is high, the price is low.

Demand is the quantity of goods or services people are willing to buy at different prices given their disposable income. Demand is related to purchasing power. That is; as prices increase, a smaller quantity is demanded and when prices fall, a greater quantity is demanded.

These factors affect demand:

- Changes in the population or the number of buyers.
- Changes in the income of buyers.
- Changes in the buyer's tastes and preferences.
- Changes in prices of other substitute products.

For example, changes in prices and preferences can effect a move from demand curve 1 to 2 and vice versa (Figure 3) whilst a reduction in price will cause a shift in demand from A to B (Figure 4).

Figure 3: Demand Curve moves from 1 to 2.

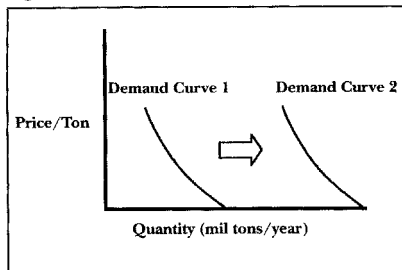
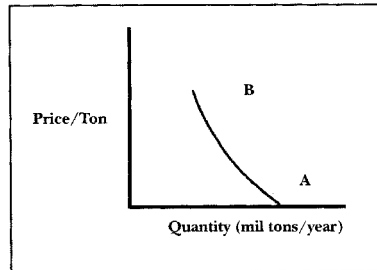
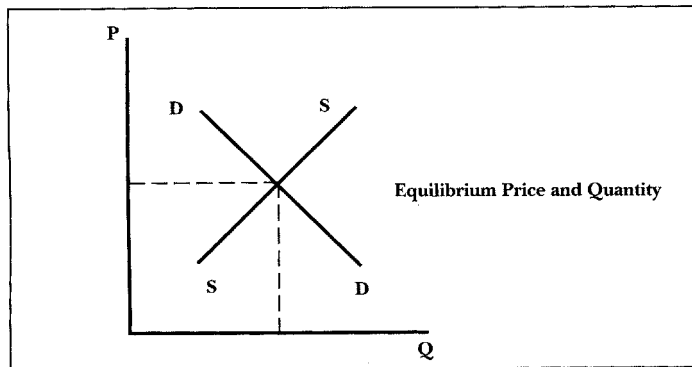


Figure 4: Shift in Demand from A to B.



The interaction between supply and demand and their effect on price is best depicted by figure 5.

Figure 5: The interaction of Supply and Demand and Equilibrium Price and Supply



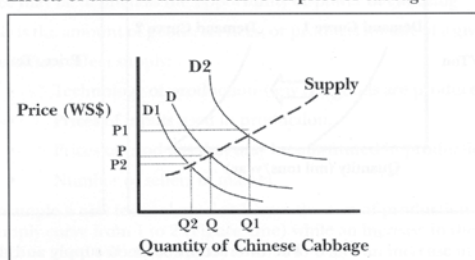
As price increases, demand for a product at a given time decreases until it gets to the equilibrium point where the supplier is willing to sell his goods at the same price as the consumer is willing to buy them.

ACTIVITY A**Demand and Price****Materials/Equipment**

- No equipment needed for this activity.

Instructions

1. Divide into groups of five.
2. Study the graphs.
3. Discuss and answer the questions.
4. Present your answers to the class for discussion.

Effects of shifts in demand curve on price of cabbage

Demand curve D is the norm for Chinese cabbage at the Fugalei market. The equilibrium price at this stage is the point PQ.

1. During the Congregational Christian Church of Samoa conference at Malua on May 2000, the demand for this produce increased tremendously; and thus it effected a move to D2. What happened to the price of Chinese cabbage?
2. What happened to the price and supply of Chinese cabbage when the quantity of Chinese cabbages demanded moved from Q to Q_e?
3. Explain what would cause the demand curve for Chinese cabbages to go from D to D1.

ACTIVITY B

Supply and Price

Materials/Equipment

- No equipment needed for this activity.

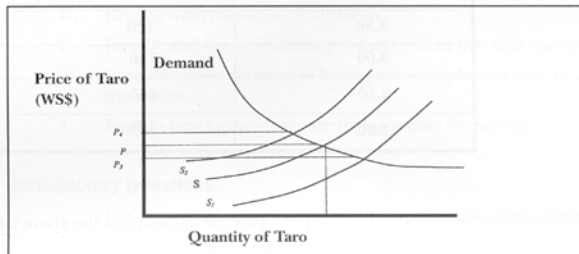
Instructions

1. Divide into groups of five.
2. Study the graphs.
3. Discuss and answer the questions.
4. Present your answers to the class for discussion.

FOLLOW-UP
QUESTIONS

1. What is an agricultural business?
2. If you were given a choice between two or more items (e.g., goods, services, etc), how will you go about deciding which item to choose?
3. What is the difference between demand and supply?

Effects of Shift in Supply Curve on Price of Taro.



Jim had access to fungicide and was able to control leaf blight in taro. As a result, he was able to increase his supply causing a shift from curve S to S_1 .

1. Supposing he was the only taro supplier in town, what happened to the price of his taro, and consequently, the demand for his taro when his supply increased?
2. What are some factors in taro production that would effect a move from curve S to S_1 ?
3. What resources are needed for the efficient production of taro?

Review

Use the data below to answer the questions.

Price(\$)	Meat Demand(kg)	Meat Supply(kg)
4.50	85	200
4.00	95	185
3.50	120	120
3.00	140	60
2.50	165	45
1.00	195	0

1. Plot the figures from the above table on graph paper.
2. Label the Yaxis as 'price' and X-axis as 'quantity'.
3. Label the curves as 'D' demand, 'S' for supply and where the graphs meet as 'E' for equilibrium.
4. What is the relationship between supply and demand?
5. What is the relationship between price and supply?
6. What is the relationship between price and demand?
7. What is the equilibrium price?
8. List the resources a broiler farmer will need to produce meat.

Unit 4: MARKETING FRESH PRODUCE

Objectives

At the end of the unit you should be able to:

1. Explain what marketing is all about.
2. Identify and list agricultural products sold in the Apia market.
3. Describe the importance of having a market-place in town or in the village.
4. Explain how farmers prepare their product for selling.

Introductory Questions

1. List all vegetables you have seen in the Apia or Salelologa market.
2. What is the most expensive vegetable you saw?
3. What is the most common vegetable in the market?
4. Which is the most common variety of banana sold in the Apia or Salelologa market?

Background Information

“Market” has many definitions. To a cook it means a shopping place for food items. To the farmer, it’s a place to sell their produce and earn their income. A market is a common place where two groups of people meet; one group includes buyers or consumers, and the members of the other group are sellers or suppliers.

The consumer is a person who usually goes to the market place to buy food items like vegetables, taro, bananas or ta’amu for their family.

Farmers can be producers, suppliers or sellers; they harvest their crops (e.g., vegetables, taro, bananas, ta’amu) and bring them to the market place to sell.

The price of produce is usually influenced by farmers, depending on supply and demand. When the supply of one product is low and the demand is high, then the farmer increases the price of that product. For example, in the rainy season, vegetable production declines due to the impact of diseases. The supply of vegetables will be very low, and if the demand for vegetables is maintained at a high level the prices of vegetables sold in the market will rise.

Some farmers send their produce to overseas markets (e.g., bananas to New Zealand or American Samoa). This is what we call the export market. The prices of produce sold in overseas markets are also controlled by supply and

FOLLOW-UP QUESTIONS

1. Write a short paragraph describing the word ‘market’ in your own words.
2. From your market investigation activity, what is the most common vegetable in the market, and what vegetable do consumers like the most?

3. Why are some vegetables more expensive than others?
4. List the food items other than vegetables sold in the local market.
5. Define supply and demand in your own words.

demand. For example, when there is a shortage of bananas in overseas markets, the price of bananas goes up because the supply cannot meet the demand. When the banana supply increases, if demand stays the same or falls then the price will drop.

To make money from your plantation, you must have good crops and be able to sell high quality fruit; this helps in marketing your bananas, as they will be more attractive to purchasers. It is also a good idea to have your banana plantation near the main road for convenient packing and transportation.

ACTIVITY A

Market Investigation

Materials/Equipment

- No equipment needed for this activity.

In this activity you are going to investigate the selling of vegetables in the Apia or Salelologa market. What you learn in this activity will help you in deciding when and what type of vegetables you can grow for sale. *Schools who have difficulty going to the Apia or Salelologa markets can do Activity B.*

Instructions

1. Divide into five groups.
2. Each group is to choose one of the following products – bananas, cucumber, beans (dwarf & long), Chinese cabbage, laupele, ginger, coconuts and egg plant.
3. You are going to investigate the marketing of the vegetable you have chosen (e.g., look at price, quality, quantity and packaging). These are some questions you should try and answer during your group investigation:
 - i. Is the price of the product you chose higher in the weekend than on weekdays?
 - ii. How much is the product sold for?
 - iii. Does the price change with the quality or quantity?
 - iv. Does the price change when there are different amounts for sale?
 - v. How do you know that the produce for sale is of good quality?
 - vi. Are all of the same product on sale of good quality?
 - vii. How is this product packaged?
 - viii. How much would the package cost?
 - ix. How many units of product per package? (e.g., count number of cucumbers per package).
 - x. What other products are sold at the market place?

4. After your group investigation, write a report of your findings using charts, graphs and diagrams.
5. Present your results to the class for discussion.



Vegetables in the Apia Market.



Photo of vegetables in a Supermarket.

ACTIVITY B

Marketing Bananas



Bananas sold in Apia Market

Instructions

Read the case study below and answer the questions that follow.

Case study

Many banana growers sell their bananas either to the local or export market. The grower who plants bananas for the market does this to make money. Banana growers must also invest some money to grow good bananas. The money spent on growing a banana crop is called the production cost. Production costs are the cost of labor, planting materials, chemicals (fungicides & fertilizers), mist-blower (sprayer), weed killer and transport.

Production costs can be divided into three groups:

- Establishment costs.
- Maintenance costs.
- Marketing costs.

Establishment cost is the money spent on starting a plantation. This money can be spent on labor to clear the land, digging plant holes, planting bananas and making fences.

Maintenance cost is the money spent on buying chemicals, (e.g., weed killer to control weeds, fungicides to spray banana leaves and fertilizer as plant food) and equipment (e.g., mist-blower and knapsack sprayer to spray for pests and diseases, knives and shovels).

Marketing cost is the money spent to pay for transporting the bananas to Apia market, and to pay for the market block. Sometimes, the grower hires labor to harvest and sell bananas in the market.

ACTIVITY B**Banana Plantation****Tasi's Banana Plantation**

Mr Tasi Lio has a five acre banana plantation at Aleisa. Mr. Lio has been selling bananas to the Apia market for the last five years and has been keeping all his records for the farm. The following table summarises his financial transactions.

Tasi's Banana Crop - Production Cost/ Benefits after Five Years	
Establishment Cost	\$ 820.00
Maintenance Cost	\$ 5930.00
Marketing Cost	\$ 150.00
Total Cost of Production	\$ 6900.00
Harvest Cash Income	
1st Year	\$ 1500.00
2nd Year	\$ 3800.00
3rd Year	\$ 4000.00
4th Year	\$ 5000.00
5th Year	\$ 5500.00
Total Income	\$19,800.00
Total Expenditure	\$ 6900.00
Profit	\$12,900.00

Questions

1. Explain the following terms in your own words; *production cost*, *income* and *profit*.
2. What is Mr Lio's profit per acre in year one?
3. Why do most farmers not make a profit in the first year of production?
4. Explain how Mr. Lio can increase his profit.

Review

In your exercise book fill in the gaps below using the following words;
buys produce, sells produce, local market, vegetable growers, production costs, revenue.

1. Apia market is also called the _____.
2. A consumer is a person who _____.
3. A supplier is a person who _____.
4. Farmers who grow vegetables are called _____.
5. Money that is spent on the farm is called _____.
6. Money coming in from sales of produce is called _____.

True or False.

In your exercise book write either *true* if the statement is correct or *false* if the statement is not true.

1. Prices of produce in the market are controlled by farmers.
2. Vegetables are usually in high demand during the rainy season.
3. When supply goes up, price also goes up.
4. Cucumber is always expensive compared to Chinese cabbage.

Unit 5: IMPORTANCE OF ANIMAL PRODUCTION

Objectives

At the end of this unit you should be able to:

1. Justify the reasons for keeping animals.
2. Describe the factors that affect animal production.
3. Suggest ways of improving local animal production.

Introductory Questions

1. What animals do people keep?
2. What did you eat yesterday?
3. Which food has protein?
4. What animals provide protein food?
5. Why do we need animals?

Background information

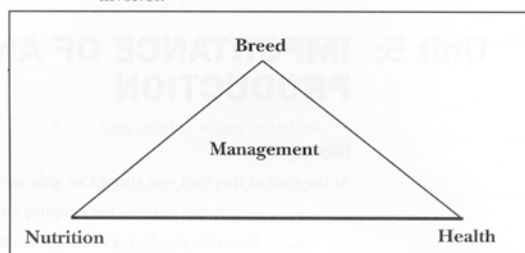
Importance of Animal Production

People domesticated animals for a number of important reasons and the primary or most important reason was for food. In Samoa, animals are used as food, gifts and offerings in traditional ceremonies like weddings, funerals and bestowing of matai (chiefly) titles. Animal power is also used to help people with their work e.g., horses and bullocks carrying or pulling cargo and ploughing the soil. Animal production is also big business and income is generated from the sale of animal products like meat, hide, fur and eggs. Today, animals are used in scientific research and chemicals from animals are utilised for making medicine, perfumes and other products.

Factors that Affect Growth and Development

Animal production depends on four main factors. These factors are breed, nutrition, health and management. If one of these factors is poorly managed, growth and development of animals could be slowed, or mismanagement could result in their sickness which could even lead to death.

Therefore it is important for livestock farmers to select suitable breeds that grow fast and well in our climate, feed animals enough balanced food, keep animals clean, healthy and free from disease and manage the farm so that it meets its objectives. The diagram below summarises what animal production involves.



ACTIVITY A

Materials/Equipment

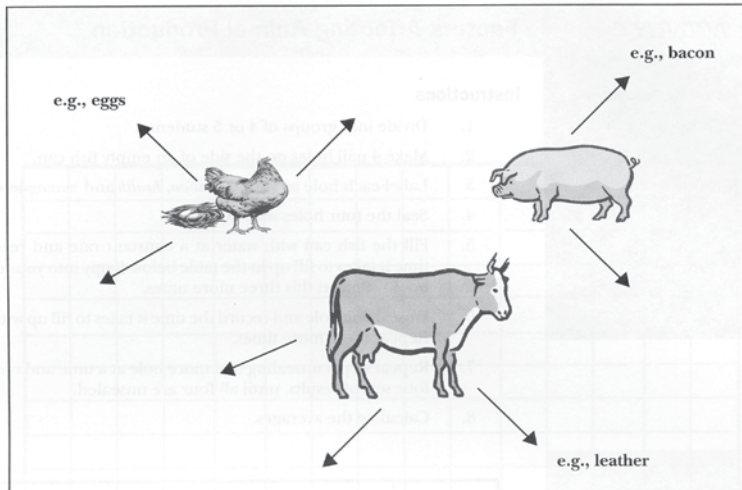
- No equipment needed for this activity.

What we can get from Keeping Animals

Instructions

- Divide into groups of 5 students.
- Discuss why keeping animals is important.
- Fill in the diagram below (in your exercise books) showing what we can get from keeping animals.
- Classify your answer under the four headings as in the table below.
- Present your group results to the class for discussion.

Economic	Social/Cultural	Health	Scientific

**ACTIVITY B****Factors of Animal Production****Materials/Equipment**

- No equipment needed for this activity.

Instructions

1. Divide into groups of 4 or 5 students.
2. Discuss the factors of animal production listed below.
3. Group them under each heading as in the table below.

Factors that can affect animal production:

Breeds, injury, stocking rate, space, handling, debeaking, de-horning, light-intensity, rain, wind, pasture, feed, identification process, castration, disease, parasites, temperature, stress, water, hygiene, climate.

Breed	Health	Nutrition	Management

ACTIVITY C

Materials/Equipment

- Empty fish can.
- 1 four inch nail.
- Hammer or stone.
- Beaker or small bucket.
- Stop-watch.
- Sellotape.

Factors Affecting Animal Production

Instructions

1. Divide into groups of 4 or 5 students.
2. Make 4 nail holes on the side of an empty fish can.
3. Label each hole as *breed, nutrition, health and management*.
4. Seal the four holes with tape.
5. Fill the fish can with water at a constant rate and record the time it takes to fill up in the table below (copy into your exercise book). Repeat this three more times.
6. Unseal one hole and record the time it takes to fill up with water. Repeat three more times.
7. Repeat step 5 unsealing one more hole at a time and recording four sets of results, until all four are unsealed.
8. Calculate the averages.

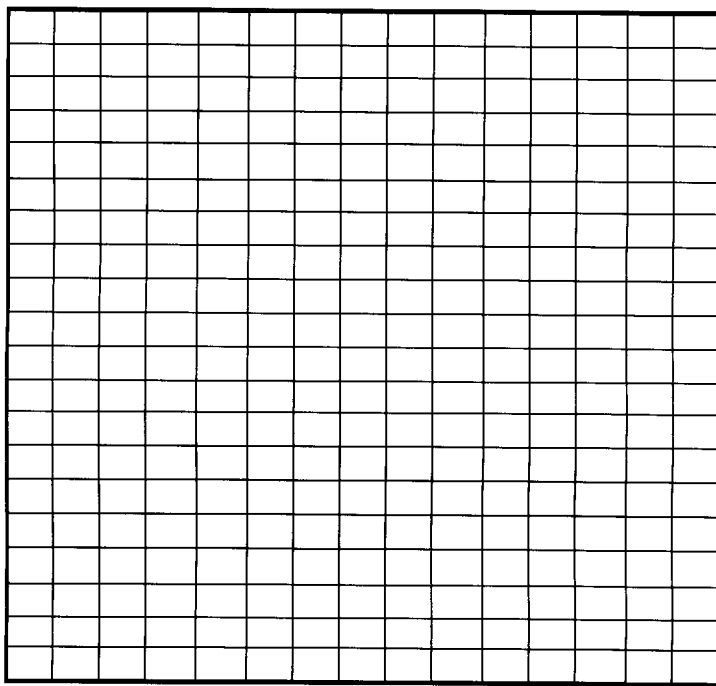
DISCUSSION QUESTIONS

1. How do we know an animal is sick?
2. What happens to its growth-rate when the animal is sick?
3. What other factors can contribute to the slow growth and development of animals?
4. How can farmers maintain an optimum growth-rate for their crops or animals?

	Number of holes sealed (closed)				
	0	1	2	3	4
Time taken to fill up fish can (seconds).					
Average					

9. Copy the grid on the following page and draw a graph using the data in the table on the grid over the page. Use only the averages. Label the **x-axis** as *Number of holes open* and the **y-axis** as *Time*.
10. Discuss the trend shown on the graph in relation to animal production.
11. Discuss and list ways in which your group can improve the growth and production of animals.
12. Present your group results to the class for discussion.

Time



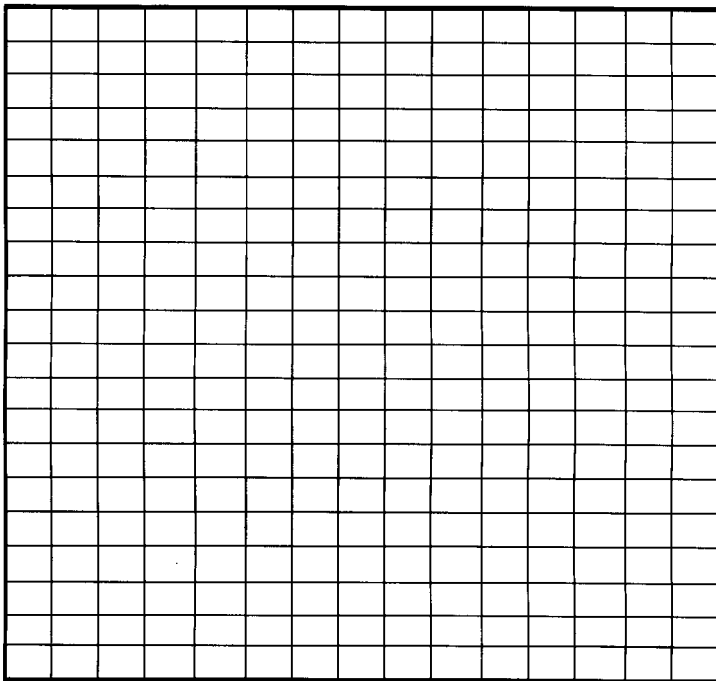
Number of Holes Open

Review

1. Copy the grid on the following page and plot the data from the table below on the grid. Label the x-axis *Weeks* and the y-axis *Growth Rate(g)*.
2. Name the graph.
3. Which breed has the highest growth rate?
4. Which breed has the lowest growth rate?
5. Explain why the growth rate of Breed C is poor compared to the other two breeds.
6. Suggest ways in which you can improve the growth rate of Breed C.
7. What products do we get from raising broiler chickens?
8. What do we do with these products? List four possible uses.

Weight of three broiler breeds over seven weeks. All the breeds are fed on the same diet.

Week	Average Weight of Broiler Chicken (g)		
	Breed A	Breed B	Breed C
1	5	5	5
2	40	40	40
3	50	70	70
4	100	80	80
5	150	100	90
6	200	150	95
7	215	155	100



Unit 6: CHICKEN PRODUCTS AND RAISING SYSTEMS

Objectives

At the end of this unit you should be able to:

1. Describe the main poultry products.
2. Select suitable poultry breeds.
3. Describe the different systems of raising chickens in Samoa.
4. State the advantages and disadvantages of each system.
5. Recommend which system(s) a farmer should use.

Introductory Questions

1. What products do you get from chickens?
2. How do you keep chickens at home?
3. Do your neighbours keep chickens the same way?
4. If they don't, then how do they keep their chickens?

DISCUSSION QUESTIONS

1. What system of raising chickens should you follow at home?
2. Why did you select this system?
3. Why are chickens raised commercially?

BACKGROUND INFORMATION

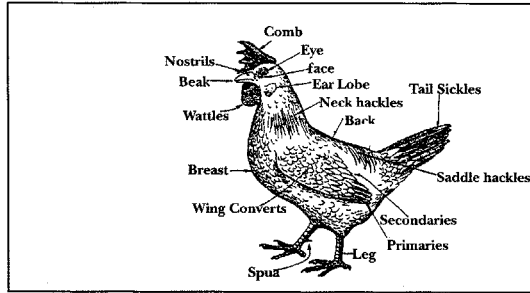
Class, breed, variety and strain of chickens

A **class** is a group of chickens that come from the same origin or geographical area. Some classes of chickens are Asiatic, American, Mediterranean and English. A **breed** is a subdivision of a class of chickens. Different breeds have particular physical characteristics like body shape, size, weight, skin colour and number and colour of shanks and toes.

A **variety** is a further subdivision of the breed. Distinguishing features of a variety are comb type, plumage type, feather pattern and beard and muff presence or absence.

A **strain** is a subdivision of a breed or a variety. It is a cross or systematically bred chicken produced by animal breeders to obtain a progeny that will combine two or more desirable characteristics of the parents.

External Parts of a Chicken



Comb Types

1. Single Comb



2. Rose Comb



3. Pea Comb



Broilers are mainly raised for their meat. Broilers raised commercially take about eight weeks before they are ready. They weigh about 2.5 – 3.0kg at this stage. Some good broiler breeds are Brachma, Cochin and Australorp.

Layers are mainly raised for their eggs. Good layer breeds lay up to 280 eggs per year. Some good layer breeds are Leghorn, Ancona, Minorca and Shaver 579.

Management Systems

Traditional System (Free range)

This method of raising chickens is used by most rural people in Samoa. This system is also called a free-range or scavenging system. Chickens are left to roam freely outside, eating whatever they can find and sleeping on nearby trees. No management is required. Egg production is low due to egg damage by pests (like dogs) and insecure places for laying eggs. The growth rate of birds is slow due to poor nutrition and the presence of diseases and parasites. Chickens raised the traditional way are more tasty and have less fat than commercially raised chickens.

Semi-Intensive System

Chickens sleep in some sort of night-time shelter and roam freely during the day, feeding on whatever they can find. Leftover food from the kitchen

is fed to the chickens once or twice a day. Egg production is not as high as the commercial system but meat has less fat and is tastier.

Commercial or Intensive System

Chickens are enclosed in a poultry shed where they are fed commercially produced feed, watered, given medication, sleep and are properly managed. They can also sleep inside a shed at night and are left to roam in an area that is fenced during the day. A high level of management is required to keep the unit profitable. Egg production is high with good layer birds laying up to 200 - 280 eggs per year. The growth rate of broilers (meat birds) is also high with birds reaching the desired weight of 2.0 - 3.0kg in 8 weeks. Cost of production is high and feed cost contributes to about 60 - 70% of the total production cost. Birds are usually high in fat.

Chicken Products

The four main chicken products used in Samoa are the meat and eggs for human consumption, feathers for decorating fine mats and poultry manure for fertilising the gardens.

Meat

Chickens for meat are raised both traditionally and commercially. Most semi-urban and rural people raise chickens traditionally for both meat and eggs. There are few commercial broiler farms in Samoa. This is because of the high production costs. It is much cheaper to import chicken from the USA. Chickens raised traditionally are known as "moa Samoa". These Samoan chickens are a delicacy to Samoans because they are more tasty and have less fat than the imported commercially produced chicken.

Eggs

Eggs are normally sold by size. Price for each size differs, with the jumbo size eggs fetching the highest price. Low quality eggs should not be sold. These are eggs with a developing embryo, cracks, irregular shape, discoloured shells and undersized. Samoa is not self-sufficient in egg production. Local demand cannot be met from local production and therefore we are still importing eggs mainly from the USA.

ACTIVITY A

Materials/Equipment

- No equipment needed for this activity.

Chicken products and breeds

Instructions

- Divide into groups of three students.
- Study the Table on the next page.
- Discuss and answer the following questions;
 - What **class** does the breed Australorp belong to?
 - Name one **breed** of the Asiatic class.
 - What country does the **Rhode Island Red** breed originate from?
 - Which breed is the best **layer** (egg producing) bird?
 - Which breed is the best **broiler** (meat producing) bird?
 - What are the two main products of chickens?

Table: Characteristics of Class and Breed of Chickens

Class and Breeds		Characteristics of Breeds within each Class						
		Layer	Average Weight (kg)	Comb Type	Colour of Ear Lobes	Egg Colour	Colour of Shanks or Toes	Skin Colour
American								
1. New Hampshire	Medium		3.5	Single	Red	Brown	Yellow	Yellow
2. Plymouth	Medium		4.0	Single	Red	Brown	Yellow	Yellow
3. Rhode Island Red	Medium		3.5	Single/Rose	Red	Brown	Yellow	Yellow
Asiatic								
1. Brahma	Low		5.0	Pea	Red	Brown	Yellow	Yellow
2. Langshan	Low		4.0	Single	Red	Brown	Bluish Black	White
3. Cochin	Low		4.5	Single	Red	Brown	Yellow	Yellow
English								
1. Australorp	Medium		3.5	Single	Red	Brown	Dark Slate	White
2. Cochius	Low - Medium		4.0	Pea	Red	Brown	Yellow	Yellow
3. Orpington	Medium		4.0	Single	Red	Brown	White	White
Mediterranean								
1. Ancona	Medium - High		2.5	Single/Rose	White	Brown	Yellow	Yellow
2. Leghorn	High		2.5	Single/Rose	White	Brown	Yellow	Yellow
3. Minorca	Medium - High		3.5	Single/Rose	White	Brown	White	White

ACTIVITY B

Materials/Equipment

- 40 local eggs selected at random (8 sets of 5 eggs).
- Egg grading board. (Grading boards can be made from cardboard with holes cut directly under holes of egg trays. This will catch eggs which fall through and prevent them from breaking).

DISCUSSION QUESTIONS

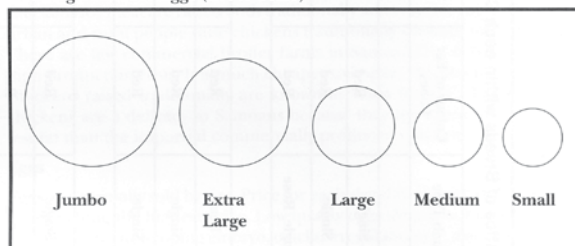
1. Why are eggs different in size?
2. What are some differences between eggs?
3. How are eggs sold?
4. What size eggs fetch the highest price?
5. How can we maintain a uniform egg size?

Grading Eggs

Instructions

1. Observe your teacher grading eggs using the grading board. Divide into groups of four or five.
2. Grade all the eggs by moving around in groups.
3. Record the number of eggs you graded for each size in the table.
4. Draw a bar graph using the information you have collected.
5. Have a class discussion based on the graph.

Grading board for Eggs (not to Scale)



Sizes of eggs

Jumbo	>5 cm in diameter	Extra Large	5 cm in diameter
Large	4 cm in diameter	Medium	3.5 cm in diameter
Small	3 cm in diameter.		

Size of Eggs	Number	Total
Jumbo >5 cm diameter		
Extra large 5cm diameter		
Large 4 cm diameter		
Medium 3.5 cm diameter		
Small 3 cm diameter		

ACTIVITY C**Systems of raising chickens****Materials/Equipment**

- No equipment needed for this activity.

Instructions

1. Work in groups of three students.
2. Observe the three pictures below.
3. Discuss and label the pictures using the following words; *Commercial Farming, Traditional Farming and Semi-subsistence Farming.*
4. Discuss the advantages and disadvantages of each system. Copy the table over the page in your workbook and fill in your answers.
5. Present your results to the class for discussion.

Diagram 1*Diagram 2**Diagram 3*

System of Raising Chickens	Advantages	Disadvantages
1. Traditional (Free Range)		
2. Semi-intensive		
3. Commercial or intensive		

Review

1. List five chicken products and state how they are used.
2. Give two reasons why eggs are graded.
3. Select three good dual-purpose (good for both egg and meat production) chicken breeds from the table on page 35.
4. Given the following resources, which system of raising chickens will you use? Give five reasons for your answer.

Resources:

- 3 acres of land (two acres under coconuts, one acre woodland).
- \$2000 tala.
- Access road.
- Water and power.
- Two males and eight layer hens.
- Two rolls of chicken wire.
- A son studying part-time at USP Alafua (B/Agr program).
- Pick-up truck.

Unit 7: HANDLING CHICKENS

Objectives

At the end of this unit you should be able to:

1. Hold chickens in the correct way.
2. Determine the sex of chicks.
3. Control the temperature requirements of chicks.
4. De-beak chickens.
5. Slaughter and dress chickens.

Introductory Questions

1. How can you tell the sex of a chicken?
2. Have you seen jumbo-size eggs?
3. Why are chickens de-beaked?
4. Why must chickens be handled carefully?
5. How do you slaughter and dress chickens at home?

Background Information

Handling chickens

Chickens must be handled carefully to avoid injury, stress and birds escaping. Special attention must be given to handling young chicks because they can easily get injured by rough handling.

Determining of sex

Students must learn the skill of identifying the sex of birds in order to sort out the males and females. Layer farms will raise the females for layers and either cull the males or keep some for breeding. Broiler farms will raise both male and females for eight weeks before preparing them for sale.

De-beaking

Feather pecking is a problem that can result in the injury and death of chickens. One of the main causes of feather pecking is overcrowding. If pecking happens the best solution is to de-beak the chickens.

Other possible solutions are;

- The reduction of stock density by expanding space available or removal of some birds.
- Improve the bird's diet.
- Treat birds for lice and ticks.
- Remove aggressive birds.

De-beaking can help prevent chickens from pecking each other and reduce feed wastage. Many farmers make it a standard practice to cut a portion of the upper beak and the tip of the lower beak off. Other farmers de-beak only if the flock starts pecking. Do not de-beak if chickens are allowed to free range for food. De-beaked chicken cannot pick up food from the ground. The top beak should be cut back by half to two thirds for layers and one third for broilers, while the bottom beak should be cut one quarter to one third for layers and not at all for broilers.

Slaughtering and dressing birds

There are few humane ways of slaughtering birds. Some religious groups will not eat the meat if birds are not slaughtered using the correct religious method. Commercial slaughter-houses slaughter birds in a cost effective manner and to ensure that the quality (tenderness and colour of meat) of the meat is maintained. There are many local ways of slaughtering birds. Feathers are normally removed by using boiling water or by just plucking them directly.

Controlling temperature in brooders

Young chicks must be kept under controlled temperatures if they are separated from their mothers. The ideal temperatures at which to keep chicks in brooders are given in Table 2.

Table 2: Temperature Requirements of Chicks

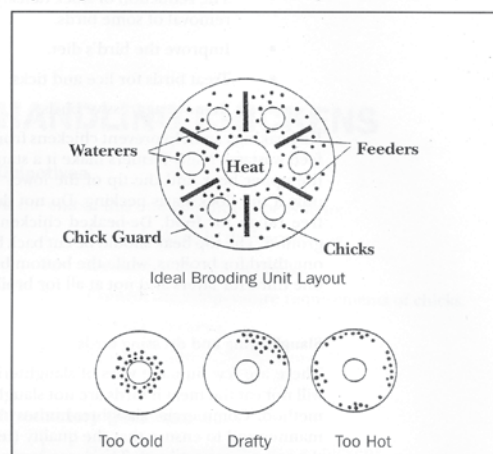
Age of Chicks	Temperature under Cover(°C)	Temperature of building (°C)
Day-old - 1 week	35	(minimum 15)
1 - 2 weeks	30	
2 - 3 weeks	26	
3 - 4 weeks	23	

Chicks will respond to the level of temperature by moving away from the heat source if the temperature is too high and moving close to the heat source if the temperature is too low. The temperature of the brooder must be adjusted according to the chicks' behaviour.

DISCUSSION QUESTIONS

1. What is the best way of slaughtering chickens?
2. What effects do different slaughtering methods have on meat quality (e.g., tenderness)?
3. Why must chickens be bled before being dressed?
4. Why is a cut made around the vent area?

Diagram of behaviour of chicks when a brooder is too hot, cold or just right.



ACTIVITY A

Holding Chickens

Materials/Equipment

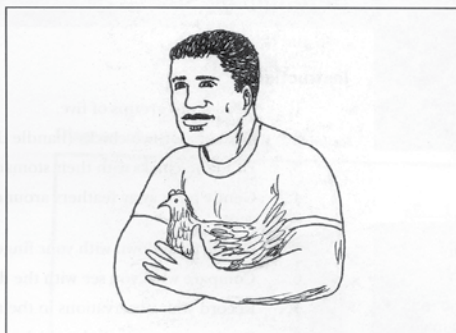
- 2 mature live chickens.

Instructions

Make sure the chicken's legs are securely tied to prevent it from escaping.

1. Listen and observe your teacher demonstrate how to correctly hold a chicken.
2. Gently try and hold the chicken in the right way.

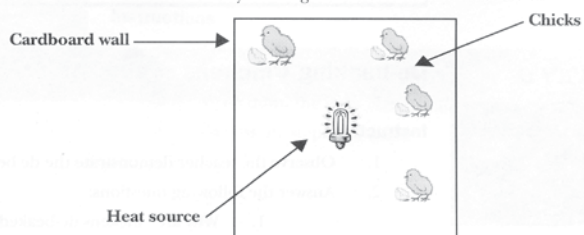
Diagram showing how to hold a chicken

**ACTIVITY B****Controlling Temperature Requirements of Chicks****Materials/Equipment**

- Five to ten 1-2 week old chicks.
- Heat source – hurricane lamp, candle, electric bulb, heater.
- Cardboard/a big box /hardboard.
- Masking tape.

Instructions

1. Divide into groups of four or five.
2. Build a brooder.
3. Put the heat source in the middle of the box.
4. Put the chicks in the box.
5. Observe where the chicks are located.
6. Draw a birds-eye view diagram to show where the chicks are located.
7. Increase the temperature of the heat source.
8. Observe and draw a diagram of where the chicks are now located.
9. Decrease the temperature, observe and draw a diagram of the chicks location.
10. Discuss in your groups why the chicks are located in different directions when the temperature changes.
11. Present your diagrams to the class for discussion.



ACTIVITY C**Materials/Equipment**

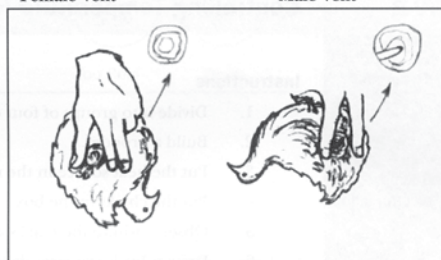
- Five to ten live 1-2 week old chicks.

DISCUSSION QUESTIONS

1. What was the ratio of female to male chicks you observed?
2. Why is it important to determine sex of chicks?
3. What other ways can you use to determine the sex of young chicks?
4. Do female chickens need male chickens for producing eggs?

Determining Sex**Instructions**

1. Divide into groups of five.
2. Take one or two chicks (handle them with care).
3. Hold the chicks with their stomach facing upwards.
4. Gently push away feathers around the vent area to expose the vent.
5. Gently push down with your finger the area around the vent.
6. Compare what you see with the diagram.
7. Record your observations in the table.
8. Do the same with all the chicks.

Female Vent**Male Vent**

Sex	Numbers	Total
Female		
Male		

ACTIVITY D**Materials/Equipment**

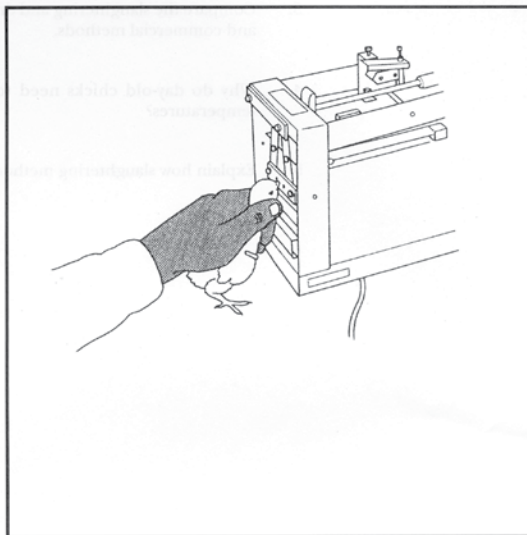
- Five to ten live chickens.
- De-beaking machine.

De-beaking Chickens**Instructions**

1. Observe the teacher demonstrate the de-beaking of chickens.
2. Answer the following questions:
 1. Why are chickens de-beaked?
 2. How much of the beak is cut off?

3. How will the chicken pick up food and drink water after de-beaking?
4. Is de-beaking necessary?
5. What effect does de-beaking have on the performance of a chicken?

Diagram of a Chicken being debeaked



ACTIVITY E

Slaughtering and Dressing Chickens

Materials/Equipment

- One or more live chickens.

Instructions

1. Observe the teacher demonstrate how to slaughter and dress a chicken.
2. Write down the steps with the aid of diagrams.
3. Discuss the steps in groups.

Review

1. Explain why chickens are sexed when they are 1-2 days old.
2. Describe some likely effects on production of de-beaking birds.
3. Compare the slaughtering and dressing of chickens using local and commercial methods.
4. Why do day-old chicks need to be kept under controlled temperatures?
5. Explain how slaughtering methods affect meat quality.

Unit 8: THE MANAGEMENT OF REPRODUCTION AND GROWTH

Objectives

At the end of this unit you should be able to:

1. Name the parts and explain the functions of the female and male reproductive organs.
2. Describe the different growth stages of layers and broilers.
3. Identify and compare the features of good and poor layers.

Introductory Questions

1. Does a hen need a rooster to produce eggs?
2. Have you ever seen chicks hatch?
3. How many eggs does a hen normally brood on?
4. How many eggs of the brood usually hatch?
5. How many chicks live to be used for meat or eggs?
6. How long does a hen sit on the eggs before they hatch?

Background Information

Reproduction

Only hens that have been mated successfully by a rooster or artificially, can lay fertilised eggs. The fertilised egg will develop into an embryo and hatch after about 22 days from fertilisation. Sexes can be determined by looking at the inner part of the vent.

Only the left ovary is functional in laying hens (if the right one becomes functional it normally produces testosterone causing the birds to cease production and grow large bright red combs).

The immature ovary contains many hundreds of minute yolks and at sexual maturity some of these yolks start to develop. The ovary of the laying hen will contain several yolks in various stages of development. Each yolk is enclosed in a thin membrane called the *vitelline membrane*. Around this membrane is a sac or follicle which supplies the yolk with nourishment by means of a network of tiny blood vessels. The yolks mature seven to ten days after they start to grow and at this stage the yolk slips out of the follicle and into the funnel-shaped opening of the oviduct (the infundibulum). It remains in the infundibulum for approximately eighteen minutes and if the hen has been previously mated, it is at this stage that the ovum is fertilised.

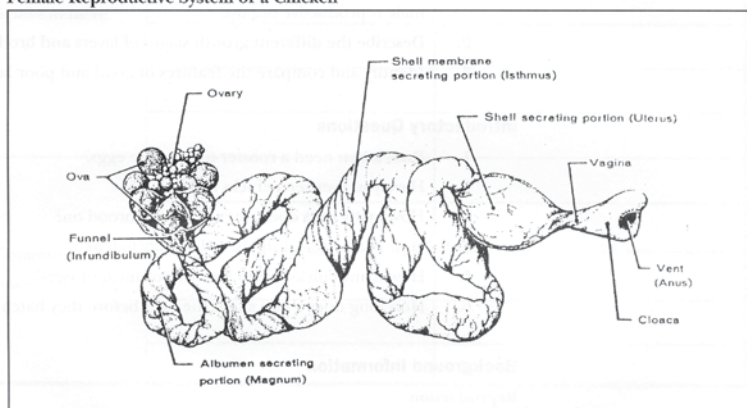
FOLLOW UP QUESTIONS

1. Do layers lay solid eggs? Explain.
2. Why is it important for farmers to have a good understanding of the different growth stages of layers and broilers?

From the infundibulum the egg descends to the magnum region where the layers of albumen are secreted around the yolk. It remains in this region for approximately three hours. It next moves into the isthmus region of the oviduct where the two shell membranes are secreted around the albumen. It remains in this region for one and a quarter hours.

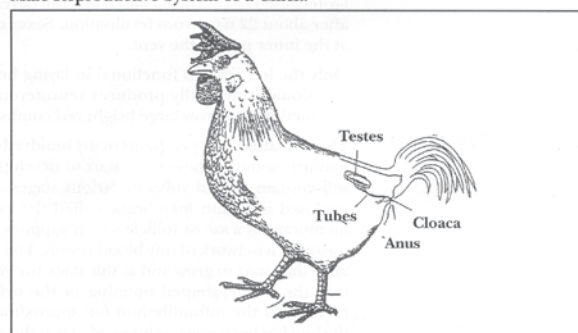
Lastly the egg descends into the oval shaped uterus region where it remains for twenty to twenty-one hours. In the uterus more albumen and water are added so the egg is plumped to its conventional egg shape. In addition the shell is laid down around the egg in the uterus. This is a slow process taking approximately eighteen hours. This is one of the main constraints to more rapid egg production. Sometimes, in particularly young pullets, two eggs are shed into the uterus at the same time resulting in the formation of a double yolked egg (one shell being secreted around two eggs at the same time). Alternatively, only one will be surrounded by a shell and one will be laid without a shell; a soft-shelled egg.

Female Reproductive System of a Chicken



3. What are the characteristics of a good layer?
4. What are the characteristics of a good broiler?
5. Why are there differences in the characteristics of layer and broiler birds?

Male Reproductive System of a Chick.

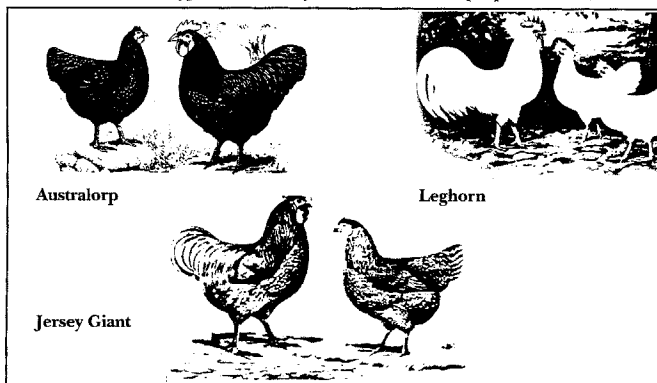


Starting a New Flock

The type of chicken you choose is dependent on what your plans are. Chickens have been bred for three reasons:

- **Egg-laying** - These are birds that, provided they are properly fed, will produce one egg a day. They do not go broody and if they hatch a clutch of chicks, they tend to be bad mothers. These birds are nervous and difficult to confine. The White Leghorn and the Shaver are representatives of the egg-laying type.
- **Meat** - These birds have heavy bodies and produce good quality meat, but are poor layers. Examples are the Jersey Giant and the Indian Game Bird.
- **Dual purpose** - Dual purpose means the birds have two uses. These birds are good layers and also produce plenty of meat. They are good brooders and the best type for backyard poultry farmers. The Australorp and Rhode Island Red are two examples of this type.

Pictures of the three types of birds (layer, broiler and dual purpose breeds)



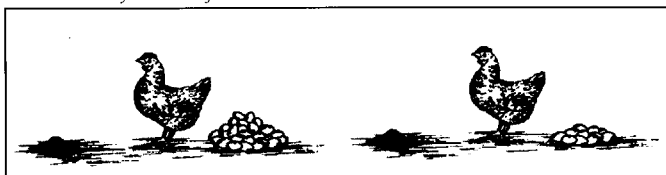
Management of Breeding

If you are planning to breed from the hens you will need a rooster. The number generally recommended is:

- For dual-purpose and heavy breeds – one rooster for 10 to 12 hens.
- For light breeds - one rooster for 10 to 15 hens.

It is wise to have an extra rooster in a rest pen. Rotating roosters every two weeks keeps the rooster aggressive. If two roosters are kept with the flock, they spend energy fighting, but three roosters are generally more peaceful.

Which bird do you want to feed?



Layer Management

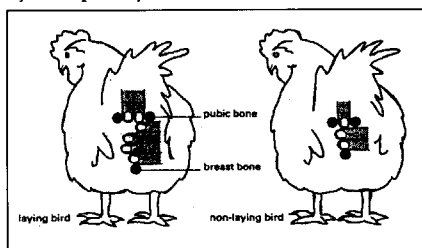
Because you keep layers longer, you must have better housing for them. The important factors to take into account when you plan to commercially raise layer-type chickens are the following.

1. Feed Space – minimum of 10 cm per chicken.
2. Water – use of the V trough or nipples.
3. Ventilation of the shed – need 2 cubic feet of uniformly distributed air per minute per half kg of bodyweight.
4. Artificial Light – 16 hours of daylight per day or one 40-watt bulb per 200 sq. ft of floor at 6 to 7 ft. height off the floor.
5. Nutrition – birds are animals of habit so make gradual changes in their feed.
6. Hygiene and Sanitation – completely clean out the house between each batch of hens.

Culling of Layers

Culling may increase the profits from a laying flock by up to ten percent. This takes experience, for some layers may be going through periods of non-productivity. As you gather eggs, gently examine the hens that have just laid. Their combs will be large, bright red and waxy, their ear lobes and wattles will be smooth and soft. The area between their pubic bones and breastbone will be large, soft and pliable, and their vents will be large, oval and moist. If they have been laying for several weeks, they will look bleached since the yellow pigment is going into their eggs. You can place three fingers between a good layer's pubic bones and four between her breastbones and pubic bone. Her feathers may be a bit worn and dirty from visiting the nest often.

Pictures of distinguishing characteristics of a good layer and poor layer



After about four weeks it should be obvious which are poor layers. A hen that is not laying will have a shrivelled, pale and scaly comb, her wattles and ear lobes will be rough and dry. Her vent will be small, puckered, yellow and dry. Her abdomen will be hard and fatty.

Table 3. Characteristics of Good Layers and Poor Layers

Characteristic	Good Layer	Poor Layer
Comb	Large, smooth, bright red, glossy	Dull, dry shriveled, scaly
Face	Bright red	Yellowish tint
Vent	Large, smooth, moist	Shrunk, puckered, dry
Pubic Bones	Thin, pliable, spread apart	Blunt, rigid, close together
Abdomen	Full, soft, pliable	Contracted, hard, fleshy
Skin	Soft, loose	Thick, underlaid with fat
Separating High and Low Producers		
Characteristic	High Producer	Low Producer
Vent	Bluish white	Yellow or flesh color
Eye Ring	White	Yellow
Ear Lobe	White	Yellow
Beak	White	Yellow
Shanks	White, flattened	Yellow, round
Plumage	Worn, soiled	Not much wear
Molting	Late, rapid	Early, slow
Characteristics of Desirable Producers		
Time of maturity	Leghorns begin to lay at 4 to 5 months, Reds and Plymouth Rocks at 5 to 6 months.	
Rate of production	Hens lay at least 220 eggs per year.	
Broodiness	Birds are seldom broody.	
Persistence in production	Good producers lay consistently for 12 to 15 months.	

Broiler Management

Meat birds are kept for only 8 to 9 weeks so their requirements are not as demanding as they are for layers. Things that should be kept in mind include; plenty of room for feeding since quick growth is required, plenty of water available so they drink as they eat and no overcrowding, since they should not spend any energy fighting or pecking at each other.

In a commercial setting broilers should not be kept with layers. The two varieties should be separated by 200 meters because layers harbor diseases that could be disastrous for broilers. Also, different age birds cannot be kept in the same coop. Care needs to be made with the flooring for broilers because with their heavier weight, their legs are weaker.

After eight to twelve weeks, the broiler's rate of weight gain slows to the point where it is no longer economically wise to continue feeding them. This is the best time to slaughter them or take them to market.

Table 4: Growth of Chickens

Age in weeks	Weight (kg)		Daily Consumption (kg)		Feeder Depth (cm)	Space Required (sq.m)	Water Needs (L)
	Broiler	Layer	Broiler	Layer			
1.	0.09	0.08	0.11	0.11	5	6.5	.02
2.	0.20	0.09	0.15	0.15	5	6.5	.08
3.	0.49	0.16	0.29	0.29	5	6.5	.08
4.	0.69	0.24	0.37	0.37	5	6.5	.08
5.	1.22	0.40	0.48	0.48	8.9	6.5	.15
6.	1.57	0.59	0.54	0.54	8.9	9.3	.15
7.	1.97	0.69	0.61	0.61	8.9	9.3	.15
8.	2.00	0.76	0.67	0.67	8.9	9.3	.15
9.	1.98	0.82	0.72	0.72	8.9	9.3	.15
10.	1.96	1.07	0.81	0.81	12.5	9.3	.19
11.		1.18			12.5	9.3	.19
12.		1.18			12.5	9.3	.19
13.		1.38			12.5	18.0	.19
14.		1.51			12.5	18.0	.19
15.		1.65			15	18.0	.19
16.		1.88			15	18.0	.19
17.		1.88			15	27.6	.19
18.		1.88			15	27.6	.19
19.		2.16			15	27.6	.19
20.		2.16			15	27.6	.19
21.		2.20			15	27.6	.36
22.		2.20			15	27.6	.36
23.		2.24			15	27.6	.36
24.		2.24			15	27.6	.36

ACTIVITY A**Reproductive Organs of Male and Female Birds****Materials/Equipment**

- No equipment needed for this activity.

Instructions

1. Copy the drawings below and on the following page into your exercise book.
2. In your groups discuss and label the reproductive organs of the female and male bird using the words given below the diagrams.
3. Discuss and complete the tables by filling in the part that corresponds to the functions of the two sex organs.

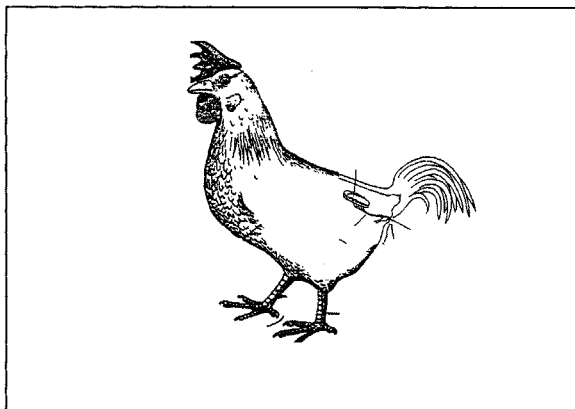
Female Reproductive System of a Chicken

Female Reproductive Parts: ovary, cloaca, shell gland, isthmus, magnum, infundibulum.

Female Reproductive Parts and Functions

Part/Organ	Function
	Produces eggs and hormones.
	Female reproductive cell.
	Funnel shaped end of the oviduct that catches ova dropped from the ovary.
	Transports ova; is the site of fertilisation.
	Albumen (egg white) secreting section of the oviduct.
	Adds the yolk and the egg white to the yolk; cell membrane secreting area, where the membrane is added to the yolk.
	Shell secretion.
Cloaca	Opening of the reproductive tract; also for excretion of waste products (urine mixed with faeces).
	Site where sperm is deposited and where egg remains for a short time before being laid.

Male Reproductive System of a Chick.



Male Reproductive Parts: testes, tubes, cloaca, vent.

Male Reproductive Parts and Functions

Part/Organ	Function
	Site of sperm and hormone production.
Tubes	Passage through which sperm is transported to the cloaca and anus.
	Site through which sperm is passed out.
	Common opening of the reproductive track; site for excretion of waste products.

ACTIVITY B

Observing Embryo Development

Materials/Equipment

- No equipment needed for this activity.

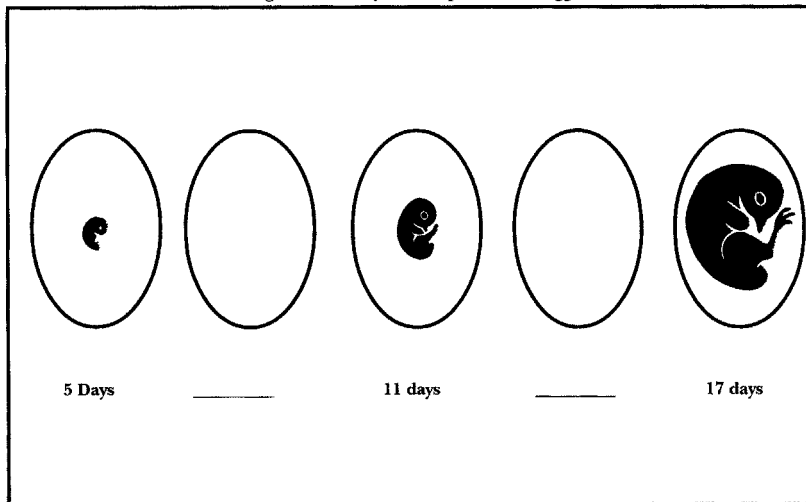
Instructions

- Observe and draw the diagram showing the different stages of embryo development in an egg in your book.
- Draw an embryo in the eggs that are empty and fill in their age in the spaces provided.

Try answering the following questions;

- Why do hens sit on their eggs?
- How long does it take for an egg to hatch?
- Where does the developing embryo get its food and oxygen from?
- How can you observe the developing embryo in an egg?

Diagram of embryo development in an egg.



ACTIVITY C**Observing Layer Birds****Materials/Equipment**

- 2 female birds (1 layer, 1 poor layer/broiler).

Instructions

Following the instructions listed below observe the two layer birds and then fill in the table in your exercise books.

Each group will handle and observe the birds one at a time. Record the variations you observe between the two birds. The teacher may have more than one set of birds for observation. (Use diagrams and pictures if you cannot find two female birds).

1. Divide into groups of five students.
2. Label the birds A and B.
2. Hold the bird properly.
3. Observe the beak.
4. Observe the eyes.
5. Observe the eye ring.
6. Look at the wattles.
7. Check the comb.
8. Check the vent.
9. Measure the distance between the pubic bones in terms of finger widths.
10. Measure the distance between the pubic bone and the breast bone in terms of finger widths.
11. Record your data in this table.
12. Discuss the variations and present your groups result to the class for discussion.

Parts of Bird	Observations	
	Bird A - Layer	Bird B - Poor layer (broiler)
Beak		
Eyes		
Eye Rings		
Wattles		
Combs		
Vent		
Pubic Width		
Ovary Area		

Review

1. Outline the different growth stages of broilers and layers.
2. Describe the difference between an egg laid by a layer and an egg laid from a successfully mated hen.
3. Describe some symptoms of defective/bad eggs.
4. Describe the characteristics of good and poor-laying birds.
5. Use the data in the Table on page 52 to plot, draw and label the graphs of the Weight Gain and Daily Consumption of broilers. Explain the trends shown on the two graphs.

Observations		Parts of Bird
Bird A - Layer	Bird B - Broiler (poultry)	Beak
		Feet
		Eye Ring
		Wattle
		Corn
		Comb
		Feather
		Feather White
		Feather Area

Unit 9: **MANAGEMENT OF ANIMAL HEALTH**

Objectives

At the end of this unit you should be able to:

1. Identify healthy and unhealthy birds.
2. Describe the actions to be taken with unhealthy birds.
3. Explain the importance of keeping birds healthy.
4. Demonstrate appropriate attitudes towards the care and treatment of animals.

Introductory Questions

1. How do you know if you are sick?
2. How does a mother tell if her baby who can't talk, is sick?
3. How would you do the same for a chick?
4. What are the signs of a sick chicken?
5. What do you do with a sick chicken?
6. Name one common disease of chickens.
7. How do we prevent disease in chickens?

Background Information

Keeping Chickens Healthy

Like humans, chickens are subject to many ailments. Good management of chickens is necessary with special attention being paid to sanitation, quality of feed and vaccinations. This will greatly reduce the chances of disease and parasites attacking the flock. Most diseases can be avoided if proper care is taken. It is very important to prevent disease, because it is costly to cure it. Some of the basic needs of chickens can be met very easily. Knowing about health problems and how to prevent and treat them is important.

Housing

There are three important reasons for providing suitable houses for poultry:

1. To protect the birds from bad weather - rain, severe sun and strong winds.
2. To protect birds from predators - cats, rats, snakes, owls and dogs.

3. To control the birds and be able to collect eggs.

The house must provide sufficient space for the fowl i.e., at least 2 ft by 2 ft per bird. Too small an area can cause stress, fighting and lower production. The house must have suitable ventilation and allow morning and evening sun in. The house should have a weatherproof roof and be easy to clean. The house needs to protect chicks from sudden chilling.

Nutrition, Feeding and Watering

Poultry have minimum requirements for energy, protein, minerals and vitamins. These requirements include 17 - 22% protein, 2.9% calcium, 0.8% phosphorous and 0.17% sodium in their diet.

Providing supplementary calcium from coral rubble or fishmeal is beneficial. Fresh coconut, dried cassava, ta'amu, taro, fishmeal, brewer's yeast and/or breadfruit are important supplementary feeds.

Make sure there is always access to fresh water. Chickens need shallow water – like a bottle filled with water turned upside down over a bowl; or a herring tin with a hole made in the side 2cm from the top – fill with water then cover with a saucer and turn upside down.

Chickens like to be fed and watered in the same place every day. Chickens fed on the ground pick up worms and germs. This makes them sick, grow slowly or even die. Besides causing sickness, if food is thrown on the ground, the bird's scratching will cause much of the food to be lost.

Hygiene and Sanitation

Completely clean out the nesting area between batches of birds. Scrape off the caked muck, and then scrub with warm caustic soda. Wear protective clothing, gloves and goggles, as caustic soda is very irritating. Finish off with a disinfectant.

When handling manure keep it dry and remove it frequently. Manure is often a neglected area of management, but it is important to remove it to minimise fly problems and unpleasant odours. Poultry manure is a valuable resource for market gardens, so do not neglect this source of income.

Stress Reduction

Chickens are very susceptible to stress and if upset will not produce at maximum potential. Examples of stress are:

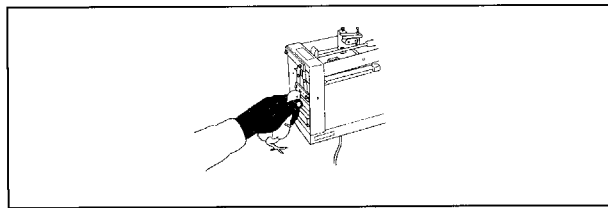
- Noise.
- Rats and predators.
- Strange people in the area.
- Change of routine.
- Moving the flock.
- Damp litter.
- New chicken in the flock.
- Violent weather.

- Very hot weather.
- Decreased day length.

Cannibalism

An accidentally injured bird with blood on it will sometimes be pecked to death by other birds. Pecking may also start when chickens are overcrowded, are fed an inadequate diet (especially if deficient in salt or protein), are growing permanent feathers or when there is a lice or mite infestation. When pecking occurs the best action is to debeak the birds.

To debeak, the top beak should be cut back $\frac{1}{2}$ to $\frac{2}{3}$ for layers and $\frac{1}{3}$ for meat chickens while the bottom beak should be cut $\frac{1}{4}$ to $\frac{1}{3}$ for layers and not at all for meat birds. Birds on open range should only be debeaked if cannibalism is a problem and then debeak top and bottom equally.



Culling

This is the removing of unwanted birds from the flock. Remove weak, sick and diseased birds to save on feed and provide more space for the productive birds.

Health Problems

Even with good management, health problems can still occur. A sick chick is inactive, doesn't stand erect and may have runny eyes or dried traces of diarrhoea around its vent. It may sleep in odd position or walk with a strange gait. Older sick chickens show obvious signs of poor condition: thin, hunched body, scraggly feathers, wings hanging loose and general weakness. Two major signs of health problems in a flock are if total feed consumption decreases or if mortality increases. It is normal to lose 1% of your flock per month. If you start out with 100 chicks, you should expect to have 90 left at the end of the year. Some will die suddenly; other will show obvious signs of disease.

Bury all dead chickens in a pit in the ground to eliminate disease transmission.

DISEASE	SYMPTOMS	CAUSES	PREVENTION	WHAT TO DO
1. Fowl Cholera	White diarrhoea, listless and sleepy, ruffled feathers, neck thrown backward, pale combs and wattles, loss of appetite and increased thirst.	Bacteria spread by droppings of infected birds.	Observe hygiene.	Do not eat sick birds. Confine sick birds or burn sick birds.
2. Coccidiosis	Bloody discharge in droppings, huddle in corners, ruffled feathers and soiled vent, loss of appetite and weight, pale comb and wattles, head pulled back and eyes closed.	Protozoa spread through contaminated food, water or litter.	Use coccidiostat. Observe Hygiene. Keep chicks in dry ventilated place. Keep chicks on raised floor until 2 months old.	Isolate sick chicks. Call para-vet urgently.
3. Leukosis - disease of nervous system	Droopiness, poor feathering, weight loss, death.	Virus spread by chicken dander.	Vaccinate chicks when day old.	None.
4. Avian Influenza	Drop in egg production; sneezing; coughing. Listless and sleepy, loss of appetite. High mortality rate.	Virus.	Do not overcrowd birds. Keep birds in a well ventilated place.	Separate affected birds.
5. Fowl Pox	Appearance of grey blisters on skin.	Virus.	Vaccinate chickens, observe hygiene, avoid overcrowding.	Call para-vet.
6. Tape Worms	Chickens gaping for air. Chickens stop eating and are weak. Usually affects chickens about 3-8 weeks of age.	Roundworms spread through the faeces of animals.	Raise young chickens off the ground. Rotate on clean ground. Use insecticides for cockroaches.	Call vet to organise drenching programme.
7. Round Worms	Lethargic and weak, variable appetite, stunted growth, loss of weight, low egg production.	Worms.		Isolate birds. The para-vet can supply drugs for treating worms.
8. Lice and Mites	Restless and nervous, pale comb and wattles, lowered egg production.	Lice and Mites.	Clean nest frequently. Use tobacco leaves for nesting material. Provide dust bath.	Burn infested material.
9. Crop Bound	Crop extended.	Obstruction or indigestion.	Keep small gravel available. Keep plenty of fresh water available.	Give the bird warm water and rub gently. Hold the bird with head downwards, squeeze crop and let liquid run out.

ACTIVITY A**Characteristics of Healthy and Sick Birds****Materials/Equipment**

- Pictures or live birds.
- Healthy bird.
- Sick bird.

Instructions

1. Compare the two birds in terms of the way they eat, drink, stand, walk, their body temperature and general thrift.
2. Note the differences in the table below.

Characteristics	Healthy Bird	Sick Bird
Amount they Eat		
Amount they Drink		
How they Stand		
How they Walk		
How their Wattles Look		
How their Eyes Look		
How their Vents Look		
How their Feathers Look		
What are their Body Temperatures		
How Active are they		
How their Wings Hang		
Note any other Differences		

ACTIVITY B**Diseases****Materials/Equipment**

- No equipment needed for this activity.

Instructions

1. Work in groups of 3 to 5 students.
2. Give each group a case study.
3. Have them answer the following questions using the background information.
 1. What is the important information – clues?
 2. What disease, if any, do you suspect?
 3. How would you confirm that it is that disease?

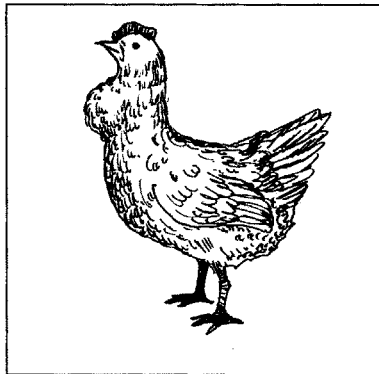
4. What would you do while you are confirming that it is that disease?
5. Present results to the class for discussion.

Case 1:

You return home from going to a cousin's wedding. You left the care of your chickens with the neighbour since your whole family wanted to go. You find the chickens are very restless and nervous and there seem to be fewer eggs. You do not know if the neighbour took the eggs.

Case 2:

You go out to the chicken yard and find some chickens are looking like this and don't seem to be eating.



Case 3:

You find some of the neighbour's chickens under the trees. They seem paralysed with outstretched wings. Their necks are thrown back. They seem thirsty and there seems to be white stuff on the ground near them.

Case 4:

There is a bird in the corner. It is about 8 months old and has pale comb and wattles. It does not want to eat and there is blood in its droppings.

Review

The statements below describe how birds can be protected from disease and parasites. Write 'treatment' after the statement if you think it describes a treatment of a disease or parasite, and 'prevention' if the statement is about prevention of disease.

1. Vaccination of birds for Leukosis disease.
2. Culling birds with Coccidiosis.
3. Cleaning sheds before putting in new birds.
4. Daily observation of birds and cleaning out of manure.
5. Breeding disease-resistant birds.
6. Providing balanced diet for chickens.
7. Demonstrate appropriate attitude towards the care and handling of birds.

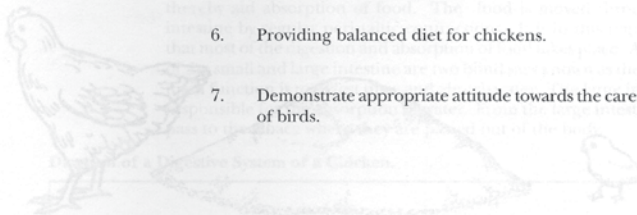


Diagram of a Digestive System of a Chicken.



Unit 10: MANAGEMENT OF NUTRITION AND FEEDING

Objectives

At the end of this unit you should be able to:

1. Identify the main parts of the chicken digestive system and their functions.
2. Investigate an aspect of the nutrition or feeding of chickens.
3. Process and interpret information on the different feed requirements for different growth stages.
4. Compare a variety of chicken feeds and feeding methods.



Introductory Questions

1. Have you observed a chicken feeding?
2. How does it eat?
3. What does it eat?

Background Information

Poultry Nutrition

Diet of poultry must include a balanced mixture of protein, carbohydrates, vitamins, minerals, fat and water according to growth stage requirements. This balanced diet is essential for the rapid growth and development of eggs and birds. Commercial feeds like chick starter and broiler/layer mash are balanced and contain all the required nutrients birds need.

The digestive system

The digestive system of the chicken is simple but very efficient. Food is picked up by the beak and selected on the basis of feel and appearance rather than taste. There is little evidence that chickens can smell or taste.

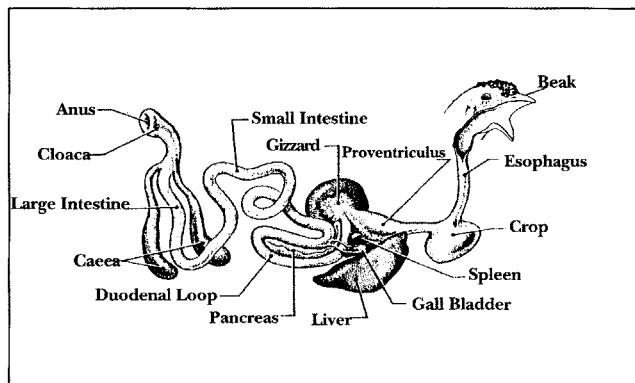
The food, which is swallowed whole, passes quickly through the oesophagus to the crop which acts mainly as a storage organ. In this organ the food is softened and acidified by lactic acid produced by bacterial fermentation. The food passes from the crop to the proventriculus by means of a short connecting tube where the food is acted on by enzymes, particularly pepsin, and further acidified by hydrochloric acid. The proventriculus is the organ which most closely resembles the mammalian stomach.

The gizzard is just beyond the proventriculus; it is a strong muscular organ which crushes the food by rhythmic contractions into a pulp. This process is assisted by the presence of insoluble grit. This hard grit is particularly valuable when whole grains are fed to birds, but is not necessary when mash feeds are used.

The food then passes into the duodenal loop which is the first part of the small intestine. This loop surrounds the pancreas which secretes pancreatic juices into the duodenum. Slightly lower down the intestine, the liver is joined to the small intestine by two ducts, one of which comes from the gall bladder, which stores bile salts.

The lining of the duodenum and the small intestine is convoluted into finger-like projections (the villi). These increase the surface area of the gut and thereby aid absorption of food. The food is moved through the small intestine by regular peristaltic contractions. It is in this region of the gut that most of the digestion and absorption of food takes place. At the junction of the small and large intestine are two blind sacs known as the caeca. Their main function is to digest fibre and absorb water. The large intestine is also responsible for the absorption of water. From the large intestine the faeces pass to the cloaca where they are passed out of the body.

Diagram of a Digestive System of a Chicken.



The following tables show the food types needed by chickens for growth and development.

UNIT 10**Summary of Food Types, Functions and Sources.**

Food Type	Function	Sources
Protein	Tissue-building and body functions.	Blood and bone, fish meal, skim milk (dried) legumes, ground nut and cotton seed nut, offal.
Carbohydrate	Energy source.	Maize, rice, wheat, cane molasses coconut, cassava, coconut meal, yam, breadfruit, ripe banana, pawpaw.
Vitamins and minerals	Develops bones. Egg production. Feather development. Needed in small amounts but essential for normal growth, health and productivity.	Soil, ash, seawater, green grass and vegetables, coral sand.
Fat	Energy source.	Coconut, offal.
Water	The body of a bird is made up of 60% water and an egg is 65 % water. Nutrients are dissolved and absorbed in water. Poisonous materials dissolved in water and are removed from the body. Controls body temperature. Lack of water limits growth and impairs egg production.	Water and water in feed.

Summary of Nutrient Requirements of Chicks, Broilers and Layers (expressed as dietary concentrations in air dry material).

Constituent		Minimum		Maximum	
Lysine %	(i) chicks	1.0		-	
	(ii) broilers	1.1		-	
	(iii) layers	0.80		-	
Methionine %	(i) chicks	0.4		-	
	(ii) broilers	0.48		-	
	(iii) layers	0.35		-	
Crude fibre %	(i) chicks	-		6.0	
	(ii) broilers	-		4.0	
	(iii) layers	-		7.0	
Metabolised energy kJ/g	(i) chicks	11.0		-	
	(ii) broilers	13.0		-	
	(iii) layers	12.0		-	
Crude protein %	(i) chicks	-		-	
	(up to 4 weeks)	18.0		-	
	(ii) broilers	-		-	
	(up to 5 weeks)	21.0		-	
	(5 -10 weeks)	19.0		-	
	(iii) layers	16.50		-	
		Chicks/Broilers		Layers	
		Minimum	Maximum	Minimum	Maximum
Calcium (Ca) %		0.7	1.3	3.0	3.5
Manganese (Mn) (mg/kg)		50.0	-	30.0	-
Sodium chloride %		0.4	0.4	0.5	0.5
Phosphorus (P) %		0.4	1.1	0.5	1.0
Zinc (Zn) (mg/kg)		40.0	-	60.0	-
Chlorine (mg/kg)		1300.0	-	1100.0	-
Niacin(mg/kg)		28.0	-	8.0	-
Pathothenic acid (mg/kg)		10.0	-	1.5	-
Riboflavin (mg/kg)		4.0	-	2.5	-
Vitamin A ₁ (IU/kg)		1320.0	-	2700.0	-
Vitamin D ₃ (IU/kg)		400.0	-	600.0	-

There are two common forms of poultry management in Samoa. They are:

1. Traditional poultry keeping

In this system the farmer does very little to improve production. The birds are free and roam around scavenging. Chickens are fed with available local food stuff such as ripe fruits, vegetables, coconuts and kitchen leftovers.

The owner uses the eggs and meat as he or she needs them. In this system, production is very low and mortality high. It is not a very efficient method of keeping poultry.

The advantage of this system is that the farmers do not have to spend any time or money on the birds and they are able to meet family egg and meat needs. Even traditional poultry keeping production can be improved by providing a balanced diet of locally available feed to the chickens such as grated coconuts, dried fish, salt, cut-up beans, fruit and vegetables.

2. Commercial poultry keeping

This is keeping poultry for business. Proper shelter and facilities are built and the farmer gets special chicks to improve production. The chickens are also fed on specially prepared commercial feeds. The success of commercial production will depend upon efficient management. In commercial poultry raising the farmer may keep only broilers or layers, or both, but they are always kept separately. This is because their management requirements are different.

Broilers are young chickens under 9 weeks of age of either sex and are grown for meat. Layers are adult females grown for their eggs. The eggs are sold for profit. Pullets are layer birds under 12 months of age.

In commercial production of broilers and layers, feed is the largest cost item representing 60–70% of the total production cost. Most farmers use ready-made commercial formulas as they are easy to use and are well balanced. Mash is the term used for any balanced mixture of meal, while pellets refer to foods that have been ground and compressed into a cylindrical form.

Different formulae are used to feed chickens of different ages and purpose. Day-old chickens are fed on a starter containing 20-21% of protein for the first six weeks of their life. If the farmer is raising broilers, the starter is changed to broiler mash at the end of six weeks. Broiler mash has 22-24% protein.

Table 8: Summary of Feed Requirements of Commercial Broilers and Layers.

Broiler		Layer	
Age (weeks)	Feed	Age (weeks)	Feed
1 - 3	Chick Starter (20-21% protein)	1 - 6	Chick Starter (20-21% protein)
3 - 8	Broiler Mash (22-24% protein)	6 - 22	Grower Feed (15% protein)
		22 - 62	Layer Mash (22-24%protein)

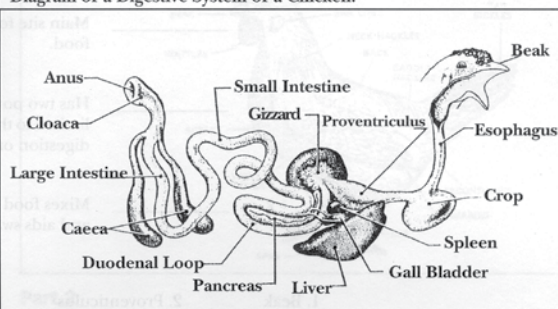
ACTIVITY A

Parts and Functions of the Digestive System

Materials/Equipment

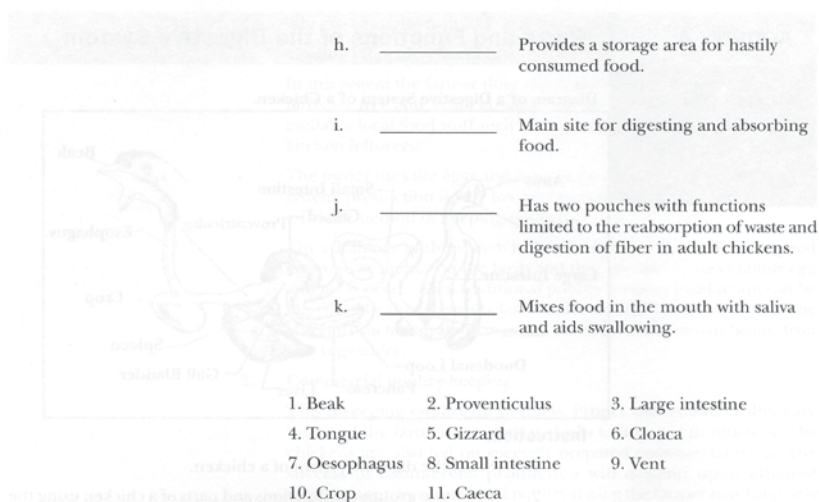
- No equipment needed for this activity.

Diagram of a Digestive System of a Chicken.



Instructions

- Study the digestive system of a chicken.
- Discuss in groups the functions and parts of a chicken using the background information.
- In your work book match the following descriptions with the appropriate parts by filling in the correct number representing the parts or organs of the digestive system.
 - _____ Muscular stomach where sand or small bits of gravel can be found.
 - _____ Glandular stomach where secretion and addition of first digestive juices occur.
 - _____ Part where the waste and egg leave the body.
 - _____ Used for drinking, grasping, tearing and scooping food.
 - _____ For storing undigested waste material and for reabsorbing water from waste.
 - _____ To transport food to the stomach.
 - _____ Common chamber into which the digestive, urinary and reproductive tract opens.

**ACTIVITY B****External and Internal Structures of a Chicken****Materials/Equipment**

- 1 dead chicken (can be more if available).

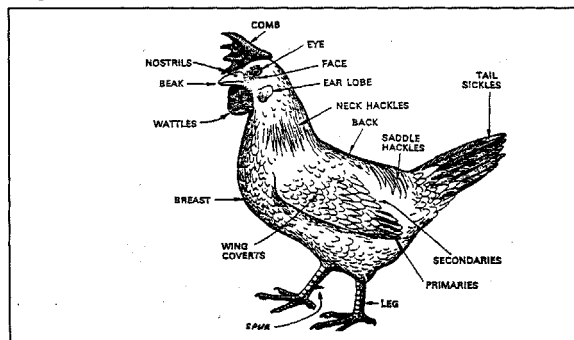
This activity may take more than one period, but if the chicken is cleaned properly and the gut removed, organs may be stored in the fridge and used when needed.

You are expected to write a report on this activity. This should be in the proper scientific form – aim, materials, method, results with all findings, diagrams and conclusions.

Instructions**Part 1**

1. Identify external parts of bird using the diagram.
2. Point out and discuss external parts and structures.
3. Remove the feathers.
4. Wash your hands with soap and water.

Diagram of External Parts

**Part 2**

1. Observe the teacher dissecting the chicken to expose the digestive system.
2. Identify parts and discuss functions.
3. Draw and label the parts of the digestive system you identified.

Part 3

1. Remove the small intestine.
2. Measure and record its length.
3. Wash your hands with soap and water.
4. Discuss the importance of its length to digestion.

Part 4

1. Remove and weigh the liver.
2. Observe its color.
3. Wash your hands with soap and water.
4. Discuss its importance to digestion and its role as a sign of good health.
5. Draw a diagram of the liver.

Part 5

1. Remove and cut open the gizzard.
2. Study the contents and record them.
3. Feel the tough, leathery inner lining.
4. Wash your hands with soap and water.
5. Draw a diagram and discuss the contents of the gizzard and its function.

ACTIVITY C**Feed Classes****Materials/Equipment**

- No equipment needed for this activity.

Instructions

Try answering these questions:

- What do you feed your chickens? List using a brainstorm exercise.
 - Do you give water to your chickens?
 - What is a balanced diet?
- Place the foods into the different classes given in the table below.
- For each class of food, state why that food is important to the chicken.

Proteins	Carbohydrates	Vitamins	Minerals	Fat	Water

ACTIVITY D**Problem Solving****Materials/Equipment**

- No equipment needed for this activity.

You are given 100 chicks plus all the materials to build a shelter for your chicks. Feed, with all the necessary nutrients included, is also supplied.

Instructions

In pairs try answering these questions:

- What are two forms of poultry keeping in Samoa?
- Why would you want to raise chickens?
- Decide what sort of chicken farm you will have. Would you raise chickens for meat or for their eggs?
- Plan the feeding timetable for your chickens. What nutrients would be most important for your chickens?
- Present your assumptions and ideas to the rest of the class.

ACTIVITY E**Feed Requirements for Different Growth Stages****Materials/Equipment**

- No equipment needed for this activity.

Instructions

Read the extract and answer the questions that follow.

Extract

Broilers are chickens raised for their meat. Layers are adult female hens raised for eggs. Pullets are layer birds under 1 year of age. Different food formulations are used to feed chickens of different age and purpose. From hatching until 6 weeks old, chickens are fed with starter mash. Starter mash contains 20 - 21% protein.

If a farmer is raising broilers, he changes from the starter to a broiler mash. Broiler mash has 22 - 24% protein.

If a farmer is raising pullets, he changes to a grower mash. Grower mash has 15% protein. When pullets are 22 - 24 weeks old, they begin to lay eggs and are now fed layer mash. Layer mash has 25% protein.

1. Why are chicks fed with starter mash for six weeks?
2. After 6 weeks, broilers are fed broiler mash. What is the importance of this?
3. Pullets, on the other hand, are fed grower mash. Why are they given lower protein feed?

ACTIVITY F**Field Trip to a Poultry Farm****Materials/Equipment**

- No equipment needed for this activity.

Instructions

1. Observe, ask questions and take notes on:
 - i. Type of feeds used.
 - ii. How often chickens are fed.
 - iii. How they are fed.
 - iv. How much they are fed.
 - v. Cost of feed.
 - vi. Equipment used.
 - vii. Breeds of chickens used.
 - viii. Draw a sketch of the farm.
2. Try answering these questions:
 - i. What chicken feeds have you seen being used?
 - ii. Describe two methods of feeding chickens that you have seen.
 - iii. Write a two-page report of the visit.

ACTIVITY 6

Nutrient Content of Poultry Food

Materials/Equipment

- No equipment needed for this activity.

Instructions

- Use the table below to answer these questions.
 - Which of the food(s) shown would you feed newly hatched chicks? Give reasons.
 - If you fed your chicken with corn and cobs only for one month, what would be the effect on your chickens?
 - What poultry food would ensure that you had beautiful feathers to decorate your fine mats with?
- Draw a bar graph to show the protein content of the five poultry foods given.

Nutrient Content of some Poultry Food

Nutrient Content	Type of Poultry Food				
	Wheat Bran	Fish Meal	Soya Bean	Bone Meal	Corn and Cob
Protein (%)	14.0	65.0	44.0	25.0	7.60
Energy (KJ/g)	7.02	12.6	11.17	5.2	14.57
Calcium (%)	0.10	5.0	0.25	22.0	
Zinc (mg/kg)	130.0	68.0	28.0	425.0	20.0
Vitamin A (mg/kg)	1000.0		340.0		
Riboflavin (mg/kg)	3.0	6.0	26.0	0.90	0.60

ACTIVITY H

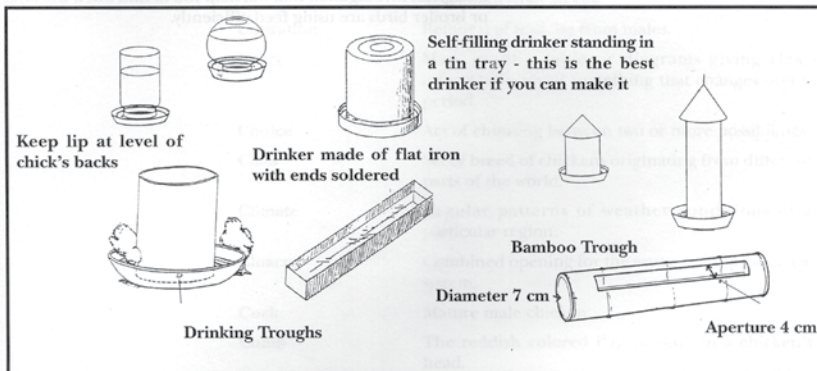
Feeder and Drinkers

Materials/Equipment

- No equipment needed for this activity.

Instructions

- Study the diagrams shown and copy them into your books.
- Compare them with the way you feed your chickens at home – traditional poultry keeping.
- Identify the advantages and disadvantages of the various methods.
- Name three important factors you should consider when installing a drinker.



ACTIVITY I

Making a Simple Drinker

Materials/ Equipment

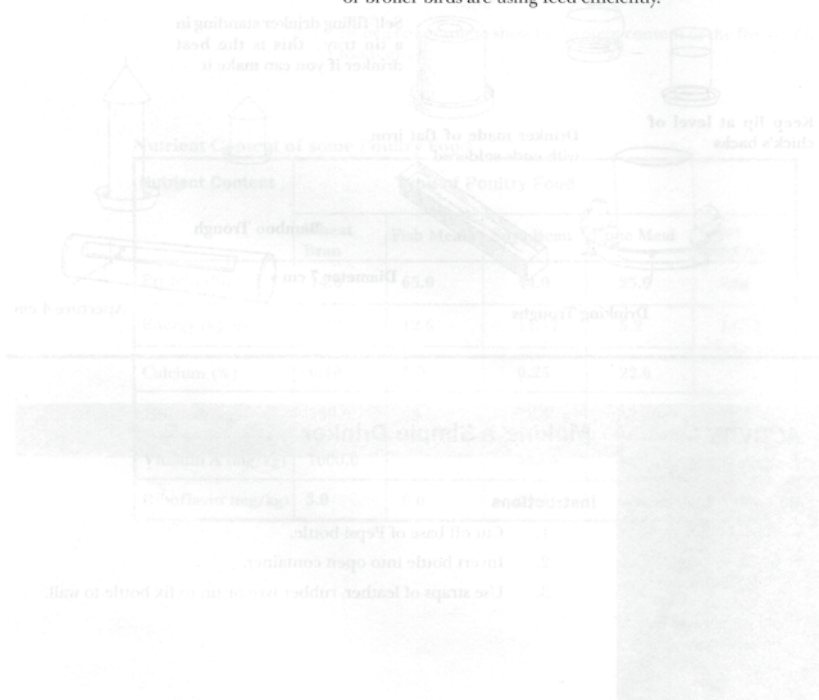
- Pepsi bottle
- Old bowl or tin plate/2 litre ice-cream container/ old rubber tyre or tin or leather strips.

Instructions

- Cut off base of Pepsi bottle.
- Invert bottle into open container.
- Use straps of leather, rubber tyre or tin to fix bottle to wall.

Review

1. Using a flow chart draw the feeds and feeding requirements of broilers and layers from day-old chicks until they are sold (broiler: 8-9 weeks) or culled (layers: 52 weeks).
2. Feed accounts for about 60-70 % of production costs. Explain two ways in which farmers can reduce this cost.
3. Design an investigation that will help you to find out if the layer or broiler birds are using feed efficiently.



GLOSSARY

Air cell	Pocket of air in an egg.
Allocate	Assign something for a special purpose.
Allocations	Action of allocating.
Averages	Result of adding several amounts together and dividing by the number of amounts.
Behaviour	Way of acting or functioning.
Breast bone	Bones located on the breast of chickens.
Broiler	Chickens raised for their meat.
Budgeting	Allocating funds wisely.
Candler	An instrument used for observing embryo development in an egg.
Castration	Removal of testicles from males.
Chart	Map, graphs, table or diagrams giving clear information about something that changes over a period.
Choice	Act of choosing between two or more possibilities.
Class	Set of breed of chickens originating from different parts of the world.
Climate	Regular patterns of weather conditions of a particular region.
Cloaca	Combined opening for the waste and reproductive system.
Cock	Mature male chicken.
Comb	The reddish colored flap of skin on a chicken's head.
Commercial farming	Producing product for sale.
Cull	To pick out and remove animals.
Debeaking	Removing sharp point of beak from chickens.
Demand	Desire of customers for goods and services.
Digestive system	Organs responsible for the break down and absorption of food in animals.
Domesticated	The taming of animals.
Economics	The study of how people and society allocate scarce resources between alternative uses to meet stated objectives.
Eliminate	To remove.
Embryo	Young animal in the early stages of development before birth.
Enterprise	The production of a particular commodity or group of commodities.
Export	Selling goods and serves to other countries.
Factor	Something that helps produce a result.

GLOSSARY

Financial	Concerning money and finance.
Fixed cost	Unavoidable cost that varies little, if at all in the short term, when the level of production changes.
Flock	A group of animals.
Forecasting	Predicting what can happen in the future.
Free range	Chicken left outside to look for their own food.
Gizzard	Pouch like part in which a bird grinds up food before digesting.
Grade	Step, stage or degree of quality.
Hen	A laying female chicken.
Human consumption	Food eaten by people.
Humane	Having or showing sympathy, kindness and understanding.
Hygiene	Practice of cleanliness as away of maintaining good health and preventing disease.
Import	Buying goods and services from other countries.
Income	Money earned from employment.
Interpret	To understand what is required or wanted.
Isolate	Remove from the rest of the animals.
Labor	Physical or mental work.
Layer	Chicken reared for its eggs.
Light intensity	Amount of light present in a given area.
Market	An exchange mechanism that brings together individuals who buy and sell.
Marketing	The ranch of activities involved in identifying demand for goods and services and providing the facilities and channels for their efficient distribution and sale.
Measurement	Width, length etc., found by measuring.
Mortality	Death rate in animals.
Nutrient	Serving as or providing nourishment for plants or animals eg minerals.
Observation	Looking and studying.
Opportunity cost	The sum foregone by choosing to use scarce resources in one way rather than in the next best way.
Outcomes	What you are expected to achieve at the end of an activity.
Parasite	Animal or plant that lives in or on another animal or plant.

GLOSSARY

Potential	In existence and capable of being developed.
Poultry	Group of birds reared for human consumption - chicken, ducks and/or turkeys.
Predators	Animals feeding on other animals.
Presentation	Explaining the results of an activity or investigation to a group using visual aids like charts, graphs and diagrams.
Price	The cost of one unit of a good or service.
Produce	Making, growing/rearing or manufacturing.
Product	A general term covering both goods and services.
Profit	Financial gain.
Progress	Moving ahead or on to the next activity.
Protein	Substance found in meat, fish, eggs and plants that is an important body building part of the diet of humans and animals.
Pubic bone	Bone located near the sexual organs.
Rapid growth	Growing or developing fast.
Rations	Fixed daily allowance of food.
Record	Written accounts of facts or events for future use.
Research	Finding out about something.
Resource	Materials used to help grow and develop plants and animals.
Scarcity	The lack of resources to satisfy fully all wants; thus we must ration their use.
Semi-subsistence	Production of food for the family and sale of any surplus.
Shanks	Shin of chickens – part of leg between the ankles and the knee.
Shelter	Structure that protects animals from the sun, wind, rain, cold and thieves.
Slaughtering	Killing an animal.
Stock density	Number of animals in a stock.
Stocking rate	Number of animals recommended for a given area.
Stress	Mental or physical distress or difficult circumstances.
Subsistence farming	Farming only for source of food for the family.
Supply	Amount of goods and services that are available.
Susceptible	Easily influenced or affected by something e.g., diseases.
Symptoms	A sign usually of illness or disease, shown by plants or animals.
Testosterone	The male sex hormone that stimulates the accessory

GLOSSARY

	sex glands, causes the male sex drive, and causes the development of masculine characteristics.
Tradition	Passing on beliefs or customs from one generation to the next.
Traditional	According to or being tradition.
Treatment	Process or manner of treating something e.g., medical treatment of birds.
Trend	Pattern of events.
Trough	Container for holding water or food for livestock
Vaccinate	Protecting animals from diseases through injections at an early age.
Variable cost	Costs that vary as the level of production varies.
Variety	Class of things that differ from others in the same general group.
Vent	Anus of a bird.
Ventilation	Free circulation of air within or through a structure.
Virus	Disease producing agents that are so small that they can not be seen under a normal microscope.
Wattles	Flap of skin under a chicken's beak.
Weight gain	The difference between the latest weight and the new weight of an animal.



Samoa Department of Education
Department of Education

© Samoa Department of Education
2001