SUBJECT:	Agricultural Science
LEVEL:	Forms 4 & 5
TOPIC:	Feed Conversion Ratio (FCR)

CSEC Agricultural Science Syllabus
SECTION C: Animal Production
3. Animal Nutrition & Management

Specific objective(s):
3.4 Calculate Feed Conversion Ratio (FCR)

Feed Conversion Ratio (FCR)

Review of Animal Nutrition and Management

All animals eat food. This food eaten by farm animals (livestock) is called **ration**. There are different types of rations e.g.

- **Maintenance Ration** –provides all the nutrients an animal needs to live without any loss or gain in weight
- **Production Ration** – provides the extra food needed by an animal for production e.g. meat, milk, eggs
- **Complete Ration** – provides all the nutrients needed in the correct amounts to satisfy both the maintenance and production requirements of the animal

The food given to livestock is called **feedstuffs** and may consist of:

- **Forage** are green plant materials (e.g. grasses and legumes) that are fed to animals
- **Concentrates** are feed produced commercially in feed mills. They can be formulated to suit the need of the animals.

Feedstuff can be a very expensive cost to farmers, especially for animals reared for meat. So farmers are interested in knowing that they are getting value for money when they feed their animals a particular ration or feedstuff.

Feed Conversion Ratio (FCR)

The Feed Conversion Ratio (FCR) is a good indicator of if a farmer is getting value for the type of feed he is feeding his animals.

The Feed Conversion Ratio (FCR) is defined as the quantity of food required by an animal (in kilograms) to produce one unit gain in weight.

Calculating FCR

$$\text{FCR} = \frac{\text{Total weight of food eaten in kilograms}}{\text{Total weight gained in kilograms}}$$

The FCR is always expressed as a ratio e.g. 4:1 (or $^{4}/_{1}$), so this animal will require 4 kg of food in order to gain 1 kg of body weight.

The lower the FCR the more efficiently an animal is able to convert its food to body mass e.g.

- The FCR for a 2-week old chick may be 1.96 and 2.88 for the same bird at 6 weeks.

Worked Example 1

At slaughter a broiler bird weighed 3kg. This bird ate 9 kg of feed during its 7-week life. Calculate the Feed Conversion Ratio for this bird.

Step 1 – Write down the formula

$$FCR = \frac{\text{Total weight of food eaten in kilograms}}{\text{Total weight gained in kilograms}}$$

Step 2 - Substitute the values into the formula where:

- Total weight gained = 3kg
- Total weight of food eaten = 9 kg

$$FCR = \frac{9\ kg}{3\ kg}$$

Step 3 – Simplify the fraction

$$FCR = \frac{\cancel{9}^{3}\ kg}{\cancel{3}\ \cancel{kg}_{1}} = \frac{3}{1} = 3:1$$

Step 4 – Write down the answer

The FCR of this broiler bird is 3:1, therefore it needed 3 kg of food to gain 1 kg of body weight.

Exercise 1 (answers on page 3)

1. On a Broiler Farm there are two pens.
   a. In Pen A – the average feed consumption for each bird 4.12 kg and a final weight of 2.33 kg. Calculate the Feed Conversion Ratio for the broiler birds in Pen A
   b. Pen B has 100 broiler birds. During the 6 weeks of their lives they eat a total of 300kg of food. The average weight of each broiler at slaughter time is 2kg. Calculate the FCR for these birds.
   c. Which pen housed the birds that were more efficient feed converters? Explain your answer

Why is the FCR important?

The FCR is an indicator of how efficiently an animal is converting the food eaten into an increase in body weight. It is important to know the FCR for animals for the following reasons:

- Minimize wastage of food. Animals with a lower FCF eat less food to gain 1kg of body weight.

- Optimizes income to farmers. When animals with a low FCR are reared, less food is fed to the animals to gain 1kg of body weight and this reduces the cost of feed to farmers and so increase the profitability of his enterprise
- Earlier maturing breeds of animals tend to have a lower FCR and so should be considered for rearing because the expenditure on feed will be reduced
- Select efficient feed converting animal on the farm that can be reared for breeding purposes and as replacement stock
- Maintaining FCR records on a weekly basis will assist in
    - Identifying weaknesses in feeding and management practices and so allow the farmer to make timely interventions
    - Ensure animals are marketed on time and before FCR increases thereby reducing the expense of keeping animals when the rate of weight gain is slowing down

Is FCR the same for all animals?

The FCR of animals vary according to their types and classes of animals e.g.:

Type of Livestock	Class of Livestock	Average FCR
Non-ruminant	Broilers	3 : 1
	Layers	5 : 1
Pseudo-Ruminant	Rabbits	3.5 : 1
Ruminant	Sheep	5 : 1
	Goats	5 : 1
	Cattle	5 : 1

References

Perrett-Pearson, M., & Ramharacksingh, R. (2020). *Agricultural Science for CSEC Examinations.* London: Macmillan Education.

Ragoonanan, S. (2017). *Agriculture for CSEC - New Edition Revision Course.* La Romaine: Caribbean Educational Publishers (2003) Ltd.

Taylor, P. (1999). *The Agricultural Science Teachers' Handbook.* London : Voluntary Service Overseas.

Review Questions:

1. Define the following terms:

Term	Meaning
Complete ration	
Concentrate	
Forage	
Maintenance ration	
Production ration	
Ration	

2. Define the term **Feed Conversion Ratio**
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3. Calculate the FCR for the following animals (answers on page 4):
   a) A cow eats 2.5kg of food each day. During the month of April, its weight increases from 42kg to 47kg. What is the FCR for this animal?
   b) Calculate how much feed will be required to feed a rabbit having a liveweight of 4kg. Given that the FCR for a rabbit is 3.5 : 1

ANSWER SHEET

Exercise 1

1. On a Broiler Farm there are two pens.

a. In Pen A – the average feed consumption for each bird 4.12 kg and a final weight of 2.33 kg. Calculate the Feed Conversion Ratio for the broiler birds in Pen A

b. Pen B has 100 broiler birds. During the 6 weeks of their lives they eat a total of 300kg of food. The average weight of each broiler at slaughter time is 2kg. Calculate the FCR for these birds.

c. Which pen housed the birds that were more efficient feed converters? Explain your answer.

a. <u>In Pen A</u> – the average feed consumption for each bird 4.12 kg and a final weight of 2.33 kg. Calculate the Feed Conversion Ratio for the broiler birds in Pen A

Step 1 – Write down the formula

$$\text{FCR} = \frac{\text{Total weight of food eaten in kilograms}}{\text{Total weight gained in kilograms}}$$

Step 2 - Substitute the values into the formula where:

- Total weight of food eaten = 4.12kg
- Total weight gained = 2.31kg

$$\text{FCR} = \frac{4.11 \text{ kg}}{2.31 \text{ kg}}$$

Step 3 – Divide 4.11 by 2.31 = 1.779

$$\text{FCR} = \frac{1.779}{1} = \frac{1.8}{1} \text{ (correct to 1 decimal place)}$$

$$= 1.8 : 1$$

Step 4 – Write down the answer

The FCR of this broiler bird is 1.8 : 1, therefore it needed 1.8 kg of food to gain 1 kg of body weight.

b. Pen B has 100 broiler birds. During the 6 weeks of their lives they eat a total of 300kg of food. The average weight of each broiler at slaughter time is 2kg. Calculate the FCR for these birds

Step 1 – Write down the formula FCR = Total weight of food eaten in kilograms / Total weight gained in kilograms

Step 2 - Substitute the values into the formula where:

- Total weight of food eaten by 1 bird = 300 kg / 100 birds = 3kg
- Total weight gained = 2kg

FCR = 3 kg / 2 kg

Step 3 – Divide 3 by 2 = 1.5

FCR = 1.5 / 1 = 1.5 : 1

Step 4 – Write down the answer

The FCR of these broiler bird is 1.5 :1, therefore each bird needed 1.5 kg of food to gain 1 kg of body weight.

c. Which pen housed the birds that were more efficient feed converters? Explain your answer.

Pen B housed the more efficient food converting birds because the FCR was lower in Pen B (FCR= 1:5) as compared to Pen A which had the higher FCR (FCR = 1:8)

Review Question 3

a) A cow eats 2.5kg of food each day. During the month of April, its weight increases from 42kg to 47kg. What is the FCR for this animal? (Hint April has 30 days)

Step 1 – Write down the formula

$$FCR = \frac{\text{Total weight of food eaten in kilograms}}{\text{Total weight gained in kilograms}}$$

Step 2 - Substitute the values into the formula where:

- Total weight gained = 47kg – 42kg = 5kg
- Total weight of food eaten = 2.5kg per day for 30 days because April has 30 days

= 2.5x 30 = 75kg

$$FCR = \frac{75kg}{5kg}$$

Step 3 – Simplify the fraction

$$FCR = \frac{\cancel{75}^{15}\ kg}{\cancel{5}_{1}\ kg} = \frac{15}{1} = 15:1$$

Step 4 – Write down the answer

The FCR of this cow is 15:1, therefore it needed 15kg of food to gain 1 kg of body weight.

b) Calculate how much feed will be required to feed a rabbit having a liveweight of 4kg. Given that the FCR for a rabbit is 3.5 : 1

Step 1 – Write down the formula

$$FCR = \frac{\text{Total weight of food eaten in kilograms}}{\text{Total weight gained in kilograms}}$$

Step 2 - Substitute the values into the formula where:

- Total weight gained = 4kg
- FCR = 3.5 : 1
- Let the total weight of food eaten = x kg

$$3.5 : 1 = \frac{3.5}{1} = \frac{x \text{ kg}}{4\text{kg}}$$

Step 3 – Cross multiply

$$\frac{3.5}{1} = \frac{x \text{ kg}}{4\text{kg}}$$

Step 5 – Write out the new equation after cross multiplying

$$1x \text{ kg} = 3.5 \times 4\text{kg}$$

Step 6 – Calculate the answer

$$x = 3.5 \times 4 = 14$$

Step 7– Write down the answer

This rabbit needs 14kg of food to gain 1 kg of body weight.