Teacher Guide Notes -
A Case for the Countryside

Maths 1

Eastrop Farm Core Activity

This section is comprised of one extended unit "Farming Figures" which focuses on Eastrop Farm in Wiltshire, near the small town of Highworth. Pupil information on Eastrop - maps and data - provides the background for an extended mathematics exercise involving spreadsheets and leading to decision making on profitability. Numerous possibilities exist for agricultural and non-agricultural use. Pupils will need to take into account economic and environmental considerations before reaching their final decisions.

Teachers may use any combination of activities, although the core activity does lead directly into the management decisions.

THE ACTIVITY

Using Eastrop Farm as an opportunity to handle data in a series of interesting applications.

STARTING POINTS/STIMULI

Video footage
Map of the site of Eastrop Farm found on Student Information Sheet 1b
Atlas to locate Swindon and Highworth or use the multimap website - www.multimap.co.uk

FOCUSED PRACTICAL TASKS

There are three exercises in this activity:

a) How much does a cow earn?
b) How much does a field earn?
c) Eastrop Farm economics.

Teachers may split the class with activities 1a and 1b or use the summary sheet for 1c.
Further problems can be posed based upon data, for example:

- inputs as a proportion of margin
- compare weight of seed to weight of grain.

NB: Figures used in these activities are correct for 2002

KEY EXPERIENCES

- Application of mathematics to real life problems.
- Making decisions to solve problems.
- Use of mathematical reasoning.
- Data Analysis.

RESOURCES

- Eastrop Farm map and tables found in the Student Information Sheet
- Farm atlas data
- Student Activity Sheet
- Further and current figures:
  - Nix Farm Management Pocket Book (University of Wye) - ISBN 0 86266225 7
  - The Farmer's Weekly

VOCABULARY

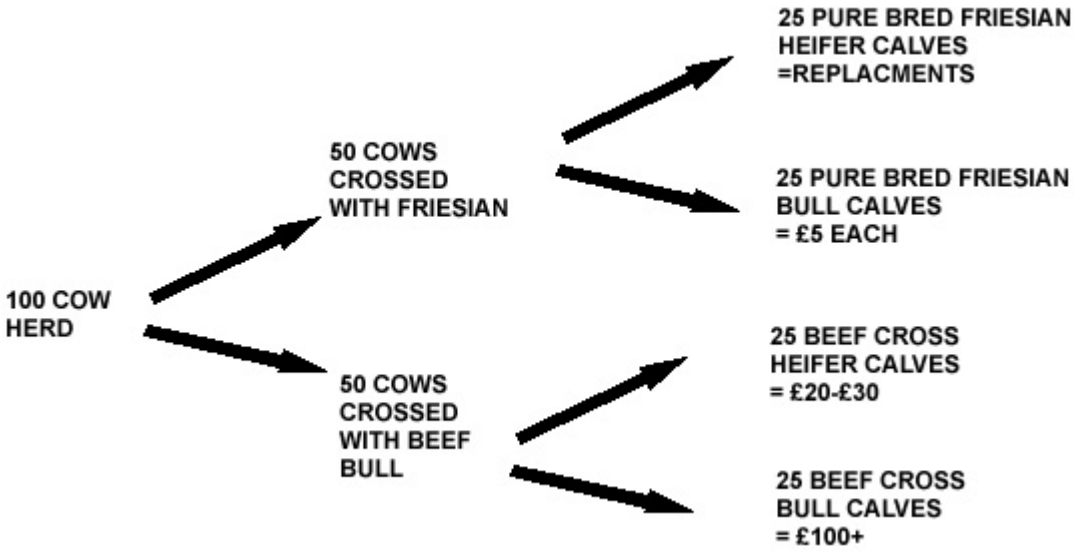
Profit
Margin

These may be new concepts and may need defining.

NB: Eastrop Farm is also the context for one of the cross curricular exercises in A Case for the Countryside. This can be used as a source of extra resources or as a preceeding or follow-up exercise to mathematics unit.

1a. HOW MUCH DOES A COW EARN?

Calf values depend on the type of calf produced. In general half the herd is inseminated with friesian semen and half with beef (the cows that the farmers does not like so much and therefore does not wish to breed replacements from!)



Pupils are given the Information Sheet 1a 'The Perfect Cow' and asked to use it to complete the Student Activity Sheet 1a. Answers are shown below:

INCOME					
1. Milk Sales	Yield 6350	x Pence/litre x 18 (highest price)		=	£1143
2. Calf Sales				=	£120 (highest price)
			Total Income	= A =	£1263
RUNNING COSTS					
1. Feed	a) Silage Tonnes	x £/tonne			
	12	x 20		=	£240
	b) Concentrate Tonnes	x £/tonne			
	1.5	x 150		=	£225
2. Bedding (straw)	No. of Bales	x £/bale			
	3	x 5		=	£15
3. Veterinary visits/Medicines				=	£40
4. Cleaning Chemical				=	£30
5. Breeding Charge				=	£35
			Total Running Costs	= B =	£585
The margin made per cow is the difference between the income and running costs					
			MARGIN =	A - B =	£678

The final figure for the margin per cow does not take account of several items:

- sale of cull cows that no longer produce milk; (approximately one quarter of the herd is replaced each year);
- calf prices vary depending on the sex, breed and age of the calf and the market place (Note - BSE has reduced this);
- milk prices will also vary depending on the milk buyer and international markets.
- Once pupils have calculated the margin per cow they might then go on to calculate the profit per cow and per Ha and scale this up to Eastrop Farm. This can then be carried forward in the Eastrop Farm Management Decision project

WORKED ANSWERS TO Q 1-4 on Student Activity Sheet 1a - How much does a cow earn?

1. The margin of milk priced at 14 pence per litre = £424 and at 18 pence per litre = £678

2. Margin per cow = £678
   Stocking rate = 2 cows/Ha
   Margin/Ha = 2 x £678
   = £1356
   Fixed Costs = £1200/Ha
   Profit/Ha = Margin - Fixed Costs
   = £1356 - £1200
   = £156/Ha
   Profit/Cow = Profit/Ha ÷ number of cows/Ha
   = £156 ÷ 2
   = £78

3. Eastrop Farm Dairy Herd
   Herd Margin = Margin per cow x number of cows
   = £678 x 120
   = £81,360
   Herd Profit = Profit per cow x number of cows
   = £78 x 120
   = £9,360

4. Margin per litre of Milk = Margin/cow ÷ number of litres
   = £678 ÷ 6350
   = 10.68 pence per litre
   Profit per litre of milk = profit/cow ÷ number of litres
   = £78 ÷ 6350
   = 1.2 pence per litre

1b. HOW MUCH DOES A FIELD EARN

Pupils are given Student Information Sheet 1b and should use this, including the with the map of Eastrop Farm, to complete Student Activity Sheet 1b. Answers are provided below:

Using the Student Information Sheet 1b, use the data to complete this sheet and calculate how much your field might earn.

Field Name:	Coleshill
Field Size:	Meadow
Crop:	12 Ha Milling Wheat

Income/Ha

Yield (tonne/Ha)	= 7.5	Price (£/tonne)			= £75	
1. Crop Yield		x	Price £/tonne		= £562.50	A
2. Subsidy					= £243	B
3. Total Income £/Ha (A + B)					= £805.50	C

Growing Costs/Ha

4. Seed Rate (Kg/Ha)	185	x	price	£0.23	= £42.55	D
5. Fertiliser/Rate (kg/Ha)	550	x	price	£0.11	= £60.50	E
6. Spray					= £115	F
7. Total Growing Costs (D+E+F)					= £218.05	G
8. Margin/Ha = C	£805.50	-	G	£218.05	= £587.45	H
9. Profit/Ha = H	£587.45	-	Fixed Costs	£550	= £37.45	J
10. Therefore the Profit made on your Yield = Field Size	12 Ha	x	J £37.45		= £449.40	

Field Name:	5 Acres
Field Size:	14 Ha
Crop:	Feed Wheat

Income/Ha

Yield (tonne/Ha)	= 9	Price (£/tonne)			= £60	
1. Crop Yield		x	Price £/tonne		= £540	A
2. Subsidy					= £243	B
3. Total Income £/Ha (A + B)					= £783	C

Growing Costs/Ha

4. Seed Rate (Kg/Ha)	50 (lowest rate)	x	price	£0.22	= £11	D
5. Fertiliser/Rate (kg/Ha)	500	x	price	£0.11	= £55	E
6. Spray					= £115	F
7. Total Growing Costs (D+E+F)					= £181	G
8. Margin/Ha = C	£783	-	G	£218.05	= £602	H
9. Profit/Ha = H	£602	-	Fixed Costs	£550	= £52	J
10. Therefore the Profit made on your Yield = Field Size	14 Ha	x	J £52		= £728	

Field Name:	Webbs Hill
Field Size:	11 Ha
Crop:	Feed Barley

Income/Ha

Yield (tonne/Ha)	= 6	Price (£/tonne)			= £55	
1. Crop Yield		x	Price £/tonne		= £330	A
2. Subsidy					= £243	B
3. Total Income £/Ha (A + B)					= £573	C

Growing Costs/Ha

4. Seed Rate (Kg/Ha)	155	x	price	£0.20	= £31	D
5. Fertiliser/Rate (kg/Ha)	400	x	price	£0.11	= £44	E
6. Spray					= £100	F
7. Total Growing Costs (D+E+F)					= £175	G
8. Margin/Ha = C	£573	-	G	£175	= £398	H
9. Profit/Ha = H	£398	-	Fixed Costs	£550	= -£152	J
10. Therefore the Profit made on your Yield = Field Size	11 Ha	x	J -£152		= -£1672	

Winter Wheat is a more expensive crop to grow, but the returns are greater.

The returns on barley are lower, but the crop is often grown in rotation. It is earlier to harvest and, therefore, ideal to grow grass or oil seed rape behind to enable it to become established before winter. Because it is harvested earlier it also helps to spread the harvest which takes pressure off during the very busy summer. A farmer can save costs by keeping back and cleaning his own grain for seed.

WORKED ANSWERS TO QUESTION 1-3 ON
STUDENT ACTIVITY SHEET 1b

QUESTION 1
Milling Winter Wheat

a) Removing the subsidy of £243/Ha

Milling Winter Wheat profit = £37.45/Ha with subsidy

= £37.45 - £243

= -£205.55/Ha without subsidy

A loss! The subsidy is intended to buffer farmers against falling grain prices.

b) Grain price increased by £15/t

Price per tonne was £75

Price per tonne now £90

7.5 x 90 = £675 A

+ £243 B

= £918 (total income)

£918 - £218.058 = £699.95 / Ha margin

£699.95 - £550 (fixed costs) = £149.95 profit

This illustrates how sensitive cereal profits are to changing cereal prices.

QUESTION 2
Increased profit may occur if:

- grain prices are higher than expected;
- rain falls at the right time to match growing requirement of the crop to give a higher yield (i.e. beginning of June);
- sun at right time to match growing requirement of the crop (i.e. after the rain in June);
- a dry harvest makes harvesting easier and the grain will not need artificially drying (i.e. July/August).

From this you can see that the profit margin is very weather dependent.

- European cereal prices for feed wheat have ranged from £120/t in November 1995 to £55/t in September 2002.

QUESTION 3
Using figures from the stock and crop data information found on Student Information Sheet 1c and the Eastrop Farm Field Details found on Student Information Sheet 1b

a) Winter Milling Wheat margin/Ha = £587.45

Profit/Ha = £37.45

Total area of Winter Milling Wheat grown = 12 Ha

Total Winter Milling Wheat margin = £7,049.40

Total Winter Milling Wheat profit = £449.40(Milling Wheat subsidy = £2,916.00)

b) Winter Feed Wheat margin/Ha = £602

Profit/Ha = £52

Total area of Winter Feed Wheat grown = 68 Ha

Total Winter Feed Wheat margin = £40,936

Total Winter Feed Wheat profit £3,536 (Feed Wheat subsidy = £16,524)

c) Winter Barley margin/Ha = £398

Profit/Ha = -£152

Total area of Barley grown = 25 Ha

Total Winter Barley margin = £9,950

Total Winter Barley profit (loss!) = -£3,800 (Barley subsidy = £6,075)

Note: the important role that subsidy plays in cereal farming.

1c. EASTROP FARM ECONOMICS

The summary sheets of stock and crop data Information found on Student Information Sheet 1b and Student Information Sheet 1c, provide a foundation to undertake the Eastrop Farm Management Decisions activity, and also provide data which can be used independently for activities determining margins and profits.

Total profit is before tax and has to be reinvested into the farm to keep up with technology and welfare improvements.

Particular points of interest are the relative importance of different enterprises.

The actual average profit for a farm in 2001 was £10,000 and £5,000 for hill farms.

Teacher Guide Notes -
A Case for the Countryside

Maths 2

Eastrop Farm Management Decisions

THE ACTIVITY

This focuses on Eastrop Farm and decision making, with reference to profitability.

FOCUSES PRACTICAL TASK

The pupils are presented with information on Eastrop Farm and asked to make decisions about how to increase profitability using their own ideas or the suggestions detailed below:

> They need to cost the various options and to decide what to recommend.
>
> The options include data which needs conscious decision making based on more than just mathematical criteria and pupils must give reasons for their decisions.

NB: This is a very suitable task for setting up a spreadsheet.

OPTIONS

> Changing crops
> Changing stock
> Increasing the amount of stock/crops
> Introducing intensive livestock farming
> Grubbing up hedgerows to increase growing/grazing area
> Introducing more livery stables
> Cutting down the woodland to increase growing/grazing area
> Set-aside
> More intensive shooting/fishing

RESOURCES

Map of Farm found in the Eastrop Farm Core Activity Student Information Sheet 1b
Details of farm, including topography etc, found in the Eastrop Farm Management Decisions Student Information Sheet
Eastrop Farm Management Decisions Student Activity Sheet

ISSUES ADDRESSED

The main theme is that agriculture is a business and decisions must be made on business line, but that such decisions have environmental and social effect.

Other issues include:

Food Production:

- Intensive vs Organic
- Animal welfare
- Soil types/crop yields
- Fallen stock/BSE

Conservation:

- Managing the environment
- Biodiversity
- Sustainability
- Water

Access and Leisure:

- Equestrian
- Fieldsports

Rural Living:

- Farm labour
- Cottage industries
- Barn conversions