





**PINNACLE AWARD** 

Introducing a Beef Unit



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Honours Degree in Agricultural Management

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## Introduction

This appraisal will look at the viability of potential beef enterprises at Rodway farm, with a conclusive suggestion as to which enterprise should be chosen. Gross margins, costings, infrastructures and how the enterprise will work will all be included to produce an informative suggestion.

An investment appraisal will be done to ensure that the chosen beef enterprise is financially viable so that the farming business can increase profits and improve educationally for the students.

Rodway Farm is part of Bridgwater & Taunton College & is situated in Cannington, 4 miles west of Bridgwater. It is 160 hectares of predominantly clay soils, & currently has 220 Holstein Friesian cows, followers & 160 ewes.

# Beef Eligibility

Rodway farm has a target to increase the herd size to 250 cows within a year. With an average calving index of 400 days (Redman, 2018), and 100 dairy replacements bred each year, 128 beef animals will be produced yearly. Currently, the lack of infrastructure means that the beef calves are sold privately. One of the two buyers is thought to offer on or below market value for the calves, but, because they are willing to take the calves unconditionally, the farm is willing to accept the lower price. However, an old shed is to be replaced which opens an opportunity to maintain beef calves, start a new enterprise and, potentially, increase profits.

The initial source of stock will be easy to obtain with non-breeding calves produced on the farm, as well as many local dairy farms and Sedgemoor market for additional stock.

An additional enterprise will see a rise in the total gross output of the farm. This in turn means that a greater gross margin should be obtained, providing the management is correct.

Furthermore, as the farm is used for educational purposes, an additional enterprise will see a wider range of educational opportunities, increasing the benefits to attending students. This potentially leads to more students wanting to attend the college.

# Beef system evaluations

Three potential beef systems:

- 1. Suckler beef
- 2. Maize and silage fed finishing cattle
- 3. Rose veal

## At a glance:

Table 1 shows average figures from The John Nix Pocketbook for Farm Managers (Redman, 2018) and Agricultural Budgeting and Costings book (Agro Business Consultants, 2020)

System	GM/head	Cost of initial stock/head	Labour hours/ month/ head	Fixed Costs/head	Estimated Profitability/ head
Suckler Beef	£166	£1,500	0.9	£94	£72
Maize and silage fed finishing	£377	£446	1.8	£175	£202
Rose Veal	£90.28	£50	1.4	£30	£60.28

Suckler FC= £155/ha @1.65cows/ha =£94, Finishing FC= Estimated, Rose Veal FC= Estimated

Table 2: Potential total profitability of each system

System	Profitability Per Head	Animals Finished Per Year	Additional Rent	Interest on purchase of stock	Estimated Total Profit
Suckler Beef	£72	90	£9,075	£5,400	-£8,715
Maize and Silage Finishing	£202	110	£20,836	£1,962	-£578
Rose Veal	£60.28	220	£0	£440	£13,261

Table 2 shows the potential profitability per head multiplied by the number of animals estimated to be finished each year, minus the additional rent of land expected (@ £726/ha), minus interest on purchase of stock (at 4%) to give an estimated total profit. It shows that a suckler system would finish the least animals per year due to the much higher space requirements. The large additional rent and interest linked to this system result in an estimated loss of £8,715.

The finishing system has the highest profitability per head by far, which is accompanied by a reasonable finishing rate, however, due to the large rental costs and interest, the system is estimated to make £11,648 of profit.

As the Rose Veal system will have the highest turnover of finished animals per year, and does not require additional land, this system is estimated to be the most profitable system.

It is also aided by having very small interest on the initial purchase of stock. The total profitability of this enterprise is £13,361.

See Appendix A for detailed system comparison.

## Recommendation

Although the maize and grass silage fed beef is the highest gross margin beef enterprise, the large increased of health and safety risks with students cannot be ignored and would be hard to mitigate. Additionally, with the extremely high land rental value around the farm, acquiring land for a relatively low GM enterprise (compared to dairy or arable) is not viable. Due to this it is thought that the farm should not adopt this system.

Suckler cows also carry a large health and safety risk especially around the calving period. Additionally, the low profit and the length of time it takes to receive an income, makes this system increasingly less viable.

The recommended system to adopt at Rodway farm is Rose Veal. This is mainly for the additional educational benefits that this system carries as there are tasks that can be completed regularly with opportunities to gain husbandry skills, benefiting the students. With stock readily available at a low price, this system will require the lowest capital. The added benefit of the system is it only uses a small amount of forage meaning that no extra land will be needed to accommodate the system.

Although out of the three systems it has the lowest gross margin per head, due to the high stocking rates and low fixed costs, this system would be the most profitable.

# Stocking Rate

Current stocking rate at Rodway Farm: 2.0575 LSU/Ha (See Table 3 in Appendix)

220 Rose Veal animals will add 33LSU to the farm.

Stocking rate with enterprise: 2.26LSU/Ha (no additional land will be required)

See Appendix B

# **Building Design**

The college is to replace the structure of the building for H&S reasons at their own expense. This means the structural cost is not calculated in this investment appraisal.

See Appendix C for building layout.

Space requirements and feed space come from Scottish Farm Advisory Service's 'Beef Cattle Housing' booklet (Farm Advisory Service, 2018).

The total cost of the internal layout of the building is £27,711.07

(See Table 4 & 5 in Appendix)

Cost does not include fitting costs (labour, machinery, electricity).

# Silage Pit Capacity

See Appendix D

There is adequate capacity in Rodway's silage pit for the additional enterprise.

## Slurry and Dung

It is estimated that the storage capacity will not be exceeded with the additional enterprise. Due to the amount of nitrogen produced, 5,333 m3 of manure needs to be exported.

See Appendix E & F

# Rose veal management

220 Dairy bull calves, at 2 weeks old, will be transferred into the enterprise from the dairy, bought in from neighboring farms and Sedgemoor market (if necessary) at an even rate throughout the year (18-19/month). They will be kept on milk replacer for 6 weeks with barley straw and cake available adlib in groups of 3. Once weaned, the calves will move into the weaned pen which consists of 21 calves. They will be fed adlib cake and barley straw. They will be moved into the next pen once they are 10 weeks of age but remain on the same diet. At 3 months, calves will be moved into larger pens with up to 52 calves. These pens will consist of a straw yard and a feed barrier separated by a scrape passage. They will be fed barley straw and cake adlib with a small amount of silage to increase the iron intake which will turn the meat a rose colour. There will be 3 large pens which will house the calves depending on their size to reduce bullying. Once the calves are 10 months of age and are fit to slaughter, they will be sold.

Keys to success:

- Monitor KPIs- regularly weighing the animals will aid the farm in improving the management of the calves
- Cleanliness- ensuring that pens are regularly cleaned and disinfected to prevent spread of diseases
- Close monitoring- all stock must to be checked regularly. Any that are ill need attention immediately to reduce the impact and spread

# Gross Margin

GROSS MARGIN		220	Calves	
Mortality		4%	96%	Survival
Average deadweight		220	kg	
Average Price	£	3	/kg	

		o <i>/</i> 11 1			£//	Ani.
GROSS OUTPUT	неаа	£/Head	Total		50	Id
Calf Sales		660	660	<u>-</u>		
			139392		£	660
Less						
Purchases of cattle	215	50	10,750		£	50.90
Transfers in	5	50	250	-	£	1.18
			11,000		£	52.08
GROSS OUTPUT		£583.60		£ 128.392	£	607.92
				,	_ `	
VARIABLE COSTS						
Concentrates:						
Milk Substitute		40.00	8,800		£	41.67
Cake to 3 months		65.25	14,355		£	67.97
Cake 3-10 months		309.28	68,042		£	322.17
Other feeds		30	6,600		£	31.25
Vet and med		24	5,280		£	25.00
Bedding		18.4	4,048		£	19.17
Miscellaneous		10	2,200		£	10.42
TOTAL VARIABLE COSTS		£496.93		£ 109,325	£	517.64
GROSS MARGIN		£ 86.67		£19,067.18		£90.28

Total GM for the enterprise = £19,067.18

See Appendix G for details

# Capital Required Total capital required for the enterprise = £73,167

Capital Required		Total	Tatal
Fixed Capital		Iotai	lotal
	Value of Buildings	27,711.07	
	Machinery	0	
	Original Purchase of Breeding Stock	0	
			£27,711
Working Capital			
	Purchase of Growing Stock	11,000	
	50% of Variable Costs	32797	
	50% of Fixed Costs Excl. Depr. & Intr.	1659	
			£45,456
Total Capital	= Fixed Capital + Working Capital		£ 73,167
Purchase of Gro	wing Stock = 220 calves x £	50	
Capital for Varia	ble Costs = Total Variable Costs for Year 1 x 50%		
	£65,595 x 50%		
Capital for Fixed	Costs = (Total Fixed costs - Interest - Depreciation) £9,016 - £2,927 - £2,771	x 50% .11 =	£3,318 x 50%

# Additional fixed costs incurred by the enterprise Total additional fixed costs = £9,016

				Total Fixed	d Costs	-	£9,016
	4%	X	£73,167			£2,926.70	£2,927
Interest							£2,771
Property Depreciation Value of new buildings		£27,711	x	10%	ра	£2,771.11	4211
Insurance	1%	x	£27,711			£277	£277
Existing: non-dairy farm		0.00	ha x	£35	per ha	£0	£554
Property Repairs New buildings		£27,711	x	2%	ра	£554	£660
Water		3	£/Calf x	220	Calves	£660	·
Electricity		5	£/Calf x	220	Calves	£1,100	£1,100
Manure Spreading		5	hrs x	£42	per hour	£212.20	5777
Contractors Slurry Spreading		278	m3 x	£2	per m3	£514.30	

# Partial Budget, Return on Capital & Payback

## Partial Budget

Items redu	icing Profit			Items Increasing profi	t	
Building Depr.	£ 27,711	x 10%	£ 2,771	Total Gross Margin (GM/Animal x Total C	alves	£19,067
Repairs	£ 27,711	x 2%	£ 554	Sold)		
Insurance	£ 27,711	x 1%	£ 277	£ 90.28 x	211	
Interest	£ 73,167	x 4%	£ 2,927			
Contractors Charges	(Appendix	6)	£ 727			
Water	£3	x 220	£ 660			
Electricity	£ 5	x 220	£ 1,100			
			£ 7,916			£19,067
		Profit	£11,152		Loss	
			£19,067			£19,067

## **Return on Capital**

Profit + Interest	x 100	
Investment		
£ 14,078 x	100 =	<b>19.24</b> %
£73,167		

## Payback

Investmen	t	= years		
Profit + Int	erest + Depr.			
£ 73,167	=		4.34	years
£ 16,849				

# Discounted Cash Flow Budget - See Appendix I

## Net Present Value= £104,936

The NPV shows that in 10 years of the enterprise running, the initial investment would have increased in value to £104,936. This proves the viability of the enterprise.

Values in Year 0 are all costs that will be incurred before the enterprise is operating. Values in Year 11 are assets of the enterprise after the 10<sup>th</sup> year.

The Net Cash Flow was completed using figures from the GM and Fixed Costs calculations to show the annual cash flow. Cash flow calculations for the first year (bar calf purchases and building costs) are only 0.6 of a full year due to the enterprise not running at full capacity.

Interest rates are falling year on year due to the diminishing value of the building.

Once the NCF had been calculated, it was multiplied in line with inflations rates of 4%. The inflation rate corresponds with the Discount Factor. The outcome from this calculation gives the DCF of the enterprise, which is then summed up to give the NPV.

# Evaluation

All four of the investment appraisals suggest that a new rose veal enterprise would be financially beneficial to the farm. With the partial budget showing a profit of £11,152 every year. The partial budget is a quick way of appraising an investment, but it is not the most precise as it does not consider the capital required or the inflation that can be expected.

The return on capital, however, does consider the capital required to start the enterprise. This calculation uses the outcome from the partial budget, adds on the interest and divides that amount by the total capital required. As a result, a rough estimate as to how much of the initial capital borrowed will be gained in income. With this enterprise the ROC is 19.24%.

Payback is a calculation that divides the initial investment by the profit made in the partial budget, plus interest and depreciation. This gives a rough guide as to how long it will take for the enterprise to payback the initial investment, in years. For this enterprise, the figure calculated is 4.34 years, further consolidating the point that this enterprise is financially viable.

A discounted cash flow is the most accurate budget completed in this investment appraisal. It considers the potential cashflow of the enterprise, the capital required, interest, the building value, and the expected inflation over a specific period. With the cash flow, it can determine when in which year specific items will be purchased and sold, so that a realistic appraisal of the enterprise can be made. This also shows that the enterprise will have a NPV of £104,936 after year 10.

The four appraisals combine to produce a clear view of how the enterprise will perform. In this case, the enterprise will be beneficial for the farm to adopt both financially and educationally.

None of the appraisals consider labour. A labour cost has not been included because Rodway farm currently has a surplus of labour meaning that an extra enterprise would only make the workforce more efficient.

The largest benefit to the college will be on the educational side. A wider range of enterprises on the farm will encourage a greater number of students to attend the college and, therefore, a rise in income from students attending. Also, by creating a better educational experience, the college will gain a better name for itself, increasing demand for spaces, the likelihood of deals from machinery dealers and a more attractive work environment for potential employees. (See Appendix H for further evaluation)

Ways of increasing gross output:

• Reducing the purchase price of calves- the £50 per calf was the average price shown in the Sedgemoor Market report. However, a lower price may be found if buying privately from individual local dairy farms. This may have the added benefit of

reducing the number of farms in which stock originates from, decreasing the potential disease threat and increasing biosecurity on the farm.

• Increasing selling price- this area is not in the farms control and is commanded by the demand for the product from the consumers. If the demand increased, it is likely to see an increase in sale value.

Ways to reduce variable costs:

- Reduce concentrates costs- this can be achieved easily by reducing the rate of concentrates fed. However, this will reduce the calf growth rates and mean that they are not at the right size or weight when they are slaughtered, resulting in a lower sale value. A more efficient way to reduce the concentrates costs is to reduce the price at which concentrates are bought. This can be done, in some cases, by entering a buying group. This gives the individual farms that are part of the group more buying power. This allows for a reduction in concentrates price as economies of scale come into play.
- Reduce bedding costs- changing the bedding material from straw to sawdust has been explained previously. This will reduce the cost of bedding the older animals without increasing disease rates. Sawdust is usually free, with the farmer only having to pay deliver charges. This would see a vast reduction in bedding costs per head.

If all of these procedures were put into place on the enterprise, then the GM per calf could be expected to rise, giving the investment appraisals a brighter outlook, and increasing the profitability of the enterprise.

## Sensitivity Analysis

## Calf Cost x Meat Price

		Product Price £ Per KG DW				
		£ 2.70	£ 2.85	£ 3.00	£ 3.15	£ 3.30
	£ 30.00	£ 44.64	£ 77.64	£110.64	£143.64	£176.64
	£ 40.00	£ 34.46	£ 67.46	£100.46	£133.46	£166.46
	£ 50.00	£ 24.28	£ 57.28	£ 90.28	£123.28	£156.28
Purchase Price £ Per Head	£ 60.00	£ 14.10	£ 47.10	£ 80.10	£113.10	£146.10
	£ 70.00	£ 3.92	£ 36.92	£ 69.92	£102.92	£135.92
	£ 80.00	-£ 6.26	£ 26.74	£ 59.74	£ 92.74	£125.74
	£ 90.00	-£ 16.44	£ 16.56	£ 49.56	£ 82.56	£115.56

Assuming constant variable costs of £517.64/calf with 4% mortality.

GM £ Per Head

The sensitivity of this enterprise has a positive outlook. It shows that, at the current purchase price of calves, a positive GM would be made if the £/kg dropped by 10% to £2.70/kg. Another positive shown by the sensitivity analysis is that even if the purchase price of calves increases by 80% to £90/calf, a healthy GM of £49.56/head will be made. At this GM, the NPV will be £32,667 after year 10. The analysis shows that the enterprise is resilient to mild price changes from either the supply chain or end market.

# Recommendation

The recommendation given to college management is that the rose veal enterprise should be integrated into the farm. As well as a small profit being made each year, the additional, alternate educational ability of the farm will be vastly improved benefiting the farm greatly. This should increase the demand for students to attend the college which in turn will increase the income elsewhere in the business (i.e. Tuition Fees, Catering income).

## Conclusion

It is evident from this report, the importance to carry out investment appraisals on all potential enterprises, so that the financial viability of the plan can be explored. It has also shown that it is vital to use more than one appraisal technique, as each of them involve different areas and each give a different background result. The appraisals also show which factors affect the outcome and what needs to be changed/adapted to make the plan more profitable. Including a sensitivity analysis allows for the flexibility of the enterprise to be realised.

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# Appendix A- System Comparison

## Suckler beef system

An average autumn calving suckler herd is likely to have a GM of £166/cow (Redman, 2018) meaning that it is an average performing beef system.

Weaned calves will be sold as store cattle, either to a private buyer if one is arranged or at Sedgemoor market. The average price for a store beef animal at 350 days old is £657 (Redman, 2018).

When the cows have come to the end of their productive life, they will be sold as cull cowspermitting they are fit to do so. It is expected that these cull cows will make £500 (Redman, 2018).

The initial purchase of suckler cows could be made at Sedgemoor market with the average price per cow being £1500 (Redman, 2018). Sucklers have the highest initial cost out of the choices.

The estimated profitability of a suckler system is £72/head. This is more than the Rose Veal enterprise, but, due to the large LSU of sucklers, far less animals will be kept, resulting in the overall profit to be lowest of the three. Due to the system requiring an additional 12.5ha, an extra £9,075 of rent will be added to the fixed costs.

## Maize and grass silage finishing beef

An intensive finishing beef system would have a quicker return on investment than the suckler herd. This is because the initial output would start at an average of 365 days after purchase.

Initial cattle can be purchased from markets for £446/head. Store cattle that are 6 months of age and at 245kg (Redman, 2018) will be kept in the system for an average of 365 days putting on 1.1kg of liveweight a day to reach an average finished weight of 647kg.

This system is likely to have a gross output of £718 with a variable cost of £249 plus a forage variable cost of £92 resulting in a GM of £377 per head. This makes it the highest GM beef system, despite it having the highest fixed costs of £175/head. The high fixed costs come from the labour-intensive nature of this system.

A drawback to this system is the additional land that would be needed. Acquiring land is especially difficult around Cannington due to the high demand for land from large businesses. This has pushed the price up far above average and therefore making it unreasonable for it to be used on a comparably low GM system (compared to dairy or cereals). To fill the shed entirely, an estimate 108 animals would be housed, therefore an

extra 86 LSU would be present on the farm. With 22.8LSU available (see Stocking Rate) on farm to increase the stocking rate to 2.2LSU/ha- 63.2LSU worth of land would be required. To house this many cattle with an LSU of 0.8 each, 28.7ha of land will have to be rented. If the land was rented out at £300/ha then it would cost the farm £20,836pa on rent for this system alone.

## Rose veal system

The cost of initial stock in this enterprise is the lowest of the three. An average price of £50/head is expected.

This enterprise has the lowest GM and potential profitability per head of £90.28 and £60.28 respectively. However, due to the turnaround only being 10 months and the small LSU/calf, a greater number of animals will be produced.

The fixed costs associated with this system are the lowest of the three at £30/head. The majority of this cost comes from the labour-intensive nature of the system. As a result of this, the Rose Veal system is estimated to have an annual profit almost £2,000 greater than the maize and silage finishing system.

# Appendix B Stocking Rate

	No.	LSU/Head	Total	
Dairy Cows	213	1	213	
Heifers 2yrs+	21	0.8	16.8	
Heifers 1-2yrs	53	0.6	31.8	
Heifers 0-1yr	99	0.4	39.6	
Rams	4	0.15	0.6	
Sheep	160	0.15	24	
Breeding Lambs	35	0.05	1.75	
Fattening Lambs	33	0.05	1.65	
		Total =	329.2	LSU
Total Forage Area	=	160	ha	
Stocking Rate =	329.2 160	=	2.0575	LSU/Ha

Table 3: Shows the current stocking rate at Rodway farm

The current stocking rate at Rodway farm is below average. This means that there can be an increase in stock numbers without having to increase forage area. The average stocking rate for a lowland farm is 2.2LSU/ forage hectare (Redman, 2018). This allows 0.1425LSU/Ha to reach average. Over 160 forage hectares 0.1425LSU/Ha equates to 22.8LSU.

A benefit linked to a rose veal system is the low dependency on forage that the livestock have- most of their diet consists of straw and concentrates, so their LSU is smaller than that of their counterparts. Additionally, they will only be on farm for 10 months.

The LSU for a beef animal under 1 year is 0.4

So, the LSU for a rose veal animal is  $10/12 \times 0.4 = 0.33$ 

Because the calves will not receive any forage for the first 3 months and when they do start to consume forage it will be at a considerably lower rate, the LSU per rose veal calf is estimated to be 0.15.

22.8/0.15= 152 rose veal animals can be kept on the farm with the current forage area for the farm's stocking rate to be 2.2LSU/ha.

The design of the building will determine how many animals can be kept. The building will be run at full capacity- as-long-as it does not affect the welfare of the animals. If the building

will allow for more than 152 animals, then more forage will be acquired as land is not worth investing in. Any additional forage will be shown in gross margins.

# Appendix C- Building Design



KE7	1
	$= 1m^2$
=	= WATER TROUGH
	= CALF PENS
	FEED BARRIERS (REMOVERBLE)
	GATE
0=	CARKE CONCENTRATE SILO
=	HAY/STRAW RACK
= =	E CARE TOUGH
	DROP IN GATE POST

# Feed Space:

Feed Space Required Per Calf:

<200kg - 150mm/calf

300kg - 150mm/calf

400kg - 190mm/calf

Total Feed Space Required Per Pen:

Pen 1- 21 x 150mm = 3.15m

Pen 2- 20 x 150mm = 3.00m

Pen 3- 52 x 150mm= 7.80m

Pen 4- 42 x 190mm= 7.98m

Pen 5- 33 x 190mm= 6.65m

Feed Space Provided:

Pen 1 = 6m – Adequate

Pen 2 = 6m - Adequate

Pen 3,4,5 = 19m- Adequate

# Space Provided Pens:

- 1. 7mx9m = 63m<sup>2</sup> of Straw Pen Space for 21, 8-10-week Calves
- 2. 9mx9m = 81m<sup>2</sup>nof Straw Pen Space for 20, 10-12-week Calves
- 10mx16m Straw Pen + 10mx5m Scrape Passage= 210m<sup>2</sup> Space for 52, 3-5-month Calves
- 4.  $10mx16m + 10mx5m = 210m^2$ Space for 42, 5-7-month Calves
- 5.  $10mx16m + 10mx5m = 210m^2$ Space for 33, 7-10-month Calves

## Table 4 Internal inventory list

	Individual Cost					
	Item	(£)	No. of items	Total Cost		
5m Gates (MVF)		75	8	£600.00		
3m Cake Trough (MVF)		47.85	8	£382.80		
Hay/Straw Rack (MVF)		31.36	6	£188.16		
3m Water Trough (MVF)		233.66	6	£1,401.96		
Drop in Post (MVF)		15.4	3	£46.20		
Wydale 5 Teat (MVF)		180	2	£360.00		
Feed Barrier (MVF)		192.25	3	£576.75		
Cake Bin (eBay)		2100	1	£2,100.00		
Calf Pen (Front) (eBay)		40	12	£480.00		
Total				£6,135.87		

Prices taken from the Mole Valley Farmers website (<u>https://www.moleonline.com/</u>) and eBay (<u>https://www.ebay.co.uk/</u>). (Mole Valley Farmers, 2020)

Feed barrier cost derived from raw material prices, MVF.

Concrete Panel dividing walls:

Table 5 Internal concrete panel diving walls

		Panels	
Price/m <sup>2</sup> (£)	Total m <sup>2</sup>	required	Total Costs (£)
31	6	6	1,116
31	8	14	3,472
31	9	6	1,674
31	10	6	1,860
	Price/m <sup>2</sup> (£) 31 31 31 31	Price/m <sup>2</sup> (£) Total m <sup>2</sup> 31 6 31 8 31 9 31 10	Price/m <sup>2</sup> (£) Total m <sup>2</sup> required 31 6 6 31 8 14 31 9 6 31 10 6

## Total

£8,122

Based on  $\pm 31/m^2$  quote given by B J Kenny Group (27/10/2020).

Base concrete:

Concrete floor- 30m x 40m= 1,200m<sup>2</sup>

1,200 x 0.15m = 180m<sup>3</sup> @ £74.74/m<sup>3</sup> = **£13,453.20** 

Concrete price based on a quote from Tor Multimix Limited (21/05/2018)

## Appendix D- Silage Pit Requirements

Current silage pit capacity: Four 60m x 10m x  $3.5m = 8,400m^3$  of silage pit capacity.

Maize silage- 1.3m<sup>3</sup>/t (Redman, 2018) Grass silage- 1.3m<sup>3</sup>/t (Redman, 2018) 8,400/1.3= 6,461t of silage capacity

Current silage consumption: 5119.2 tonnes

Table 6 Current silage pit requirements

					TONNES
213	DAIRY COWS	@	20	t/head	4260
18	HEIFERS 2-2y 3m	@	8	t/head	144
56	HEIFERS 1-2y	@	6	t/head	336
99	HEIFERS 0-1y	@	3.6	t/head	356.4
228	EWES	@	0.1	t/head	22.8
4	RAMS	@	0	t/head	0
					5119.2

Figures based on JRW handout for forage variable costs of livestock requirements for 6 months. These figures were doubled to accommodate for cattle being housed 12 months of the year.

Average consumption of rose veal animal (over 10months) = 3.5kg/day

3.5 x 305days= 1,067.5kg/head

1,067.5 x 184=196,420kg (196.4t) of silage will be used by this system/year.

196.4t + 5119.2t = 5315.6t

5315.6/6461 x 100 = 82% capacity

With the additional enterprise the farm is required to store 5,315.6 tonnes of silage per year. This is only 82% of the farm's silage storing capacity meaning that no additional silage pit capacity will be required.



# Guidance for Farmers in Nitrate Vulnerable Zones

# Field application of organic manures



Orange areas (numbered 1, 2, 3 or 4) Very high risk



Yellow areas (numbered 4 where necessary) High risk



Green areas Lower risk



Green areas Low risk



10m border around surface water

Land not normally used for

(numbered 4 where necessary)

Identifies sandy or shallow soils

Land where organic manure should never be spread

Cross-hatched areas

Red areas

White areas

spreading



50m border around boreholes

## Key for numbered coloured areas:

1 You should not spread on these fields when the surface is compacted or waterlogged

- 2 You should not spread when there is a risk of flooding
- 3 You should not spread when the soil is at field capacity i.e. when the soil is fully wetted
- 4 A field or part field with effective pipe or mole drains

Conditions leading to very high and high risk areas	Colour Map	Numbers for coloured
Fields or part fields next to a watercourse, spring or borehole when the surface is severely compacted <sup>1</sup> or waterlogged.	Orange	1
Fields or part fields that are likely to flood sometime in most winters.	Orange	2
Field or part fields next to a watercourse, spring or borehole when the soil is at field capacity " (in winter) and there is:		
a steep slope	Orange	3
a moderate slope and a slowly permeable soil (i.e. a clay soil or one through which water passes only slowly)	Orange	3
a moderate slope and a well-drained soil	Yellow	
a slight slope and a slowly permeable soil	Yellow	
All fields or part fields with effective pipe or mole drains that are not already coloured red or orange (see extra limitations below *).	Yellow	4
Very shallow soils (less than 30 cm) over gravel or rock, e.g. limestone, chalk, slates and shales.	Yellow	

Notes:

i - Severely compacted is when rain stays on the surface after rainfall.

E - Field capacity is when the soil becomes fully wetted and more rain would cause water loss by drainage. This normally happens in

III - Fields or part fields which in the last 12 months have been pipe drained, mole drained or sub-solled over drains should not be used for spreading.

Spring, wells and land drains are currently not available. Boreholes are all marked, but may not all be relevant. Please check your map for any missing water features and update accordingly.

# Appendix F- Slurry Production

## Rodway Farm

#### Slurry Wizard ~ Data entry

Total farmable area	160	hectares
Telephone STD code	01278	will be used to give typical rainfall values
Cows in herd	213	cows
Cows in milk	180	cows
Depreciation buildings	5	96
Depreciation machinery	10	96
Interest rate	5	%
Electricity cost	12	p/kW hour
Water cost	1	£/cubic metre
Slurry spreading cost	3	£/cubic metre
Water storage cost	0.5	£/cubic metre
Divert water cost	5	£/square metre
Roofing cost	80	£/square metre
Slurry storage cost	40	£/cubic metre

## Slurry storage capacity for earth bank stores

Do NOT deduct freeboard from the total depth	Total Depth metres	*Slope factor (see below)	Top length metres	Bottom length metres	Top width metres	Bottom width metres	Total volume (m3)	750mm volume (m3)	Working volume (m3)
Contraction of the second s				0		0	0	0	0
Store 1	-			0	+ +	0	0	0	0
Store 2				0	+ +	0	0	0	0
Store 3				0		0	0	0	0
Store 4				0		0	0	0	0
Store 5				0		0	0	0	0
Store o				0		0	0	0	0
Store 6		- 1.1 5 4 -	1 to 2 5 = 1	.2.5	-	Totals	0	0	0
"Slope factor : 2 = bank slo	pe 1:1, 3 .	- 1.1.3, 4 -				Total area	0		

Slurry storage capacity for rectangular & circular stores

Length m	Width m	Circumference of circular store m	Depth m (less freeboard)	Capacity m3	Area m2	Tick if Covered Store
23	36		2	1656	828	
80	30		3	7200		e
				0	0	
-				0	0	
-				0	0	
-	-			0	0	
-	-			8856	828	
	Length m 23 80	Length m Width m 23 35 80 30	Length m Width m m m m 23 36 80 30	Length m         Width m         Circumference of circular store m         Depth m (less freeboard)           23         36         2           80         30         3           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -           -         -         -	Length m         Width m         Circular store of circular store m         Depth m (less freeboard)         Capacity m3           23         36         2         1656           80         30         3         7200           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0           0         0         0         0	Length m         Widt m         Circuinarstore of circuiar store of circuiar st

Freeboard : reduce the depth to allow for freeboard (0.3 metres for a steel or concrete store and 0.75 metres for a lagoon)

#### Slurry separator

Do you operate a separator	Yes	For the slurry entering the store(s)
% reduction in slurry	35	Adjust the % to reflect the average reduction in slurry volume

#### Parlour washings to slurry store

Parlour washings to slurry store	Yes
Litres/cow/day (e.g. 20 to 30)	20

#### Uncovered dirty yard area to slurry store

	Length m	Width m	Area m2
Yard 1	60	10	600
Yard 2	30	8	240
Yard 3			0
Yard 4			0
Yard 5			0
Yard 6			0
Yard 7			0
Yard 8			0
Yard 9			0
Yard 10			0
Yard 11			0
Yard 12			0
Total yard area			840

#### Roof water area to slurry store

	Length m	Width m	Area m2
Roof 1	80	40	3200
Roof 2	65	18	1170
Roof 3	55	18	990
Roof 4	45	13	585
Roof 5	55	22	1210
Roof 6	40	30	1200
Roof 7	35	25	875
Roof 8			0
Roof 9			0
Roof 10			0
Total roof area			9230

		1		1		Iotai	AnnuarN	
Livestock	Age	Liveweight/milk yield	Number	% collected as slurry	Daily excreta	collected as slurry	output kg/year	Total N
Cattle								
Dairy Cow	After first calf	High (>9000)	213	100%	64	13632	115	24495
Dairy Cow	After first calf	Medium (6000-9000)		100%	53	0	101	0
Dairy Cow	After first calf	Low (<6000)		100%	42	0	77	0
Dairy heifer replacement	13 mths to calving		74	100%	40	2960	61	4514
Dairy heifer replacement	3<13 months		84	100%	20	1680	29	2436
Baaf Sucklar	>25 months	Large (>500)		100%	45	0	83	0
Boof Suckler	>25 months	Small (<500)		100%	32	0	61	0
	>25 months	Grindin ( -Good)		100%	32	0	50	0
Grower	12-25 months			100%	26	0	50	0
Grower	2c12 months		129	30%	20	774	34	4386
Grower	3×13 months	-	12.0	100%	26	0	54	0
Bull Beet	>3 munuts			100%	26	0	48	0
Buils for breeding	>25 monuts			100%	26	0	50	0
Bulls for breeding	3<25 months		75	0%	7	0	84	630
Calf	< 3 months		15	070	1		0.4	
Pigs		the second se		4000/	11.0	0	16	0
1 sow place inc. litters	Litter up to 7kg	with syn amino acid		100%	11.0	0	18	0
1 sow place inc. litters	Litter up to 7kg	no syn amino acid		100%	11.0	0	10	0
Weaner place		7 to 13kg		100%	1.0	0	40	0
Weaner place		13 to 31kg		100%	1.7	0	4.2	0
Grower place	Dry fed	31 to 66kg		100%	3.3	0	7.7	0
Grower place	Liquid fed	31 to 66kg		100%	6.0	0	10.6	0
Finisher place	Dry fed	>66kg		100%	4.3	0	10.6	0
Finisher place	Liquid fed	>66kg		100%	0.7	0	11.0	0
Maiden gilt place		>66kg		100%	4.0	0	12.0	0
Boar	66kg to 150kg			100%	5.0	0	12.0	0
Boar	Above 150kg			100%	8.7	0	17.5	0
Sheep				-		-	7.0	1010
Ewe	Lamb < 6 months	<60kg	160	0%	3.3	0	7.0	1210
Ewe	Lamb < 6 months	>60kg		0%	5.0	0	11.9	0
Lamb	6 to 9 months		33	0%	1.7	0	0.5	17
Lamb	> 9 months		35	0%	1.7	0	0.7	25
Goats								
Goat				0%	3.7	0	15.0	0
Deer								
Breeding hinds				0%	5.0	0	15.2	0
Other deer				0%	3.7	0	12.0	0
Horses								
Horse				0%	24.7	0	21.0	0
Layers								
Replacement layer pullets	<17 weeks			0%	0.04	0	0.21	0
Laving hens - capes	>17 weeks			0%	0.12	0	0.40	0
Laving bens - free rance	>17 weeks			0%	0.10	0	0.46	0
Broilers	- IF Hound				5.10	-		
Broiler places				0%	0.05	0	0.33	0
Broiler breader cullete	<26 weeks		-	0%	0.04	0	0.29	0
Broller breeder pullets	-20 WOOKS			0%	0.11	0	0.70	0
Turteur	#20 Weeks		-	070	0.11	U	0.70	0
Turkeys	-		-	00/	0.14	0	4.00	0
Maið	-			0%	0.14	0	0.01	0
Female	-			0%	0.11	0	0.91	0
Other			-		0.00	-	0.75	-
Ducks	-			0%	80.0	0	0.75	0
Ostriches			-	0%	0.001	0	1.4	0
TOTAL						19046		37718

## Farm Nitogen Loading

Kg Nitrogen per Ha 236

This is the nitrogen loading BEFORE the import or export of manure

The cost/benefit is based on a slurry storage cost of £40/cubic metre

Cost/Benefits	E/year
Divert roof water	38,539
Divert roof water & harvest	46,340
Roof dirty yard	-2,793
Roof dirty yard & harvest water	-2,083

# Action points

D.Lin maters		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Cubic metres		-			-	-	24	20	24	3	21	24	3	SAR
Days		31	30	31	31	28	31	30	31	30	31	10	2	000
Total excreta as slurry		590	571	590	590	552	590	571	590	571	690	590	571	6971
of averate to eliumy store		100	100	100	100	100	100	100	100	100	100	100	100	
20 EXCIDIN OF SILING ALL SILING									-	274	200	200	674	8074
Excreta to slurry store		590	571	590	590	552	590	571	590	5/1	DBG	060	1/0	1,60
Chimi consisted	Yes / 35%	617	618	666	657	559	478	428	459	432	429	478	470	6293
Cinti Acharama						*0*	445	102	142	108	112	112	108	1314
Parlour washings	Yes	112	108	112	112	101	211	oni	211	ino	116	110	ive	1011
Typical rainfall (metres)	0.761	0.072	0.074	0.083	0.081	0.063	0.061	0.050	0.056	0.051	0.048	0.061	190.0	0.761
Winter rainfall adjusted to M5		0.097	0.100	0.110	0.108	0.087								
														0.000
Own value rainiali (meus)						£	2	5	-	40	-	n	n.	747
Yard run off area to slurry store	840	82	84	93	91	73	51	42	41	43	40	10	10	141
Slurry store area	828	81	82	91	68	72	51	41	46	42	40	51	51	737
Roof water area to store	9230	898	919	1018	996	799	563	462	517	471	443	563	563	8211
Total cubic metres		1145	1147	1237	1221	1038	888	796	853	803	796	888	874	11687
Cumulative production		1145	2292	3530	4751	5788	6677	7473	8326	9129	9925	10813	11687	
Cullulative production	2222	9956	8856	8856	8856	8856	8856	8856	8856	8856	8856	8856	8856	
Total storage capacity	0000	0000	0000	1000	4405	RAUE	2470	1383	530	-273	-1069	-1957	-2831	
Canacity loss production		7711	6564	0320	4100	JUDO	0117	0001	200	1010		1441		

# Slurry Report

Rodway Farm

## Rose Veal system

Total slurry produced by the enterprise annually = 277.88m<sup>3</sup>

Total FYM produced by the enterprise annually = 3211.46m<sup>3</sup>

Table 7 Slurry and dung produced by the enterprise

Age	No. of animals	Bedding Contribution	Excreta	% as Slurry	% in Bedding	Total M <sup>3</sup> FYM/day	Total M <sup>3</sup> Slurry/day
0-3m	60	0.03	0.0075	0%	100%	2.507142	0
3-10m	129	0.05	0.019672	30%	70%	6.291391	0.76131
Total per	Day					8.798533	0.76131
Total per	Year					3211.464	277.8782

- Bedding contributions: 0-3m- using 20kg of straw/week/calf average (Teagasc, 2017). Straw= 12m<sup>3</sup>/tonne so 20kg of straw= 0.24m<sup>3</sup>/week. 0.24/7 = 0.0342857. 3-10m- using 34kg/week average.
- 2. Excreta: 0.21 and 0.60/month (DEFRA, 2011) respectively.
- 3. % stored as slurry: 30% average amount of excreta scraped away from feed passage.

Total slurry required to be stored over 5-month NVZ period- 115.75m<sup>3</sup>

Total FYM required to be stored over the 5-month NVZ period- 1338.11m<sup>3</sup>

Slurry will enter the slurry lagoon via the slurry separator which will reduce the volume being stored in the lagoon. FYM will be stored in the solids pit or as a heap in the field if required. Field heaps can only be placed in 'Low Risk' (Light green) areas show on the NVZ Risk Map (See Appendix B).

## Rodway's slurry storage capacity

Description	Length (m)	Width (m)	Depth (m)	Volume (m <sup>3</sup> )
Covered slurry	80	30	3	7,200
lagoon (liquids)				
Open concrete	36	23	2	1,656
slurry pit (solids)				
Disused silage pit	25	14	3	1,050
(solids)				

Table 8 Slurry and dung storage capacity at Rodway farm

Rodway Farm has a liquid slurry holding capacity of 7,200m<sup>3</sup>

The farm is required to hold 5 months' worth of slurry to comply with NVZ regulations.

See Appendix F for Rodway's slurry production and storage with additional rose veal enterprise at Rodway Farm.

The total amount of slurry that will be produce by the farm in the 5 months (October-March) is estimated to be 5,788m<sup>3</sup>.

It is estimated that the storage capacity will not be exceeded with the additional enterprise.

However, the total amount of nitrogen produced on the farm is 37,718kg as shown in Appendix F.

37,718kg/ 160ha = 236kg/ha which exceeds the NVZ limit of 170kg/ha.

This means that at least 66kg/ha of nitrogen must be exported from the farm to comply with the NVZ regulations.

Total nitrogen to export = 66kg x 160ha = 10,560kg

Kg of N/ m<sup>3</sup> of manure = 37,718/19046 = 1.98kg

Total manure required to be exported = 10,560/ 1.98 = 5,333m<sup>3</sup>

It is advised for the farm to export an equal amount of FYM and slurry to a near-by arable farm, so that the organic matter and N levels at Rodway farm are kept at a consistently good level.

2,650m<sup>3</sup> of FYM should be exported to a nearby arable farm.

2,683m<sup>3</sup> of slurry should be exported to a nearby arable farm.

## Appendix G- GM Details

## Output

Total calves (10m) = Space in Pens/ Individual Calf Space Requirement for Age

	Space/ Pen		Recomr	nended Sp	ace/Calf	Max Capacity/Pen
Calf	-			-		
Pens	42	m2	2.5	m2	0-8w	16
1	63	m2	3	m2	8-10w	21
2	81	m2	4	m2	10-12w	20
3	210	m2	4	m2	3-5m	52
4	210	m2	5	m2	5-7m	42
5	210	m2	6	m2	7-10m	33
					Total Calves =	184
			months			
	184 calves/	10	=	18.4 months	per month	
	18.4	х	12	=	220 Calves p	er year

Mortality = 4% (Redman, 2018)

Deadweight= 400kg LW at 50% killing out

£3.00/kg of deadweight (Agricultural Budgeting and Costings, 2020)

Calf Sales = Deadweight x price/kg x 96% survival rate

Purchase of calves = Total calves required - 5 bull calves transferred in Average price taken from Sedgemoor Auction Centre Market Report November 7th

#### Variable Costs

Concentrates	(Agricultur 2020)	al Budgeting	g and Cos <sup>-</sup>	tings,
	Milk Subst	itute @	1600 1.6	£/t £/kg
		Per Calf Total Cost	25 <b>40.00</b>	kg f/Calf
	Cake to 3 r	months @	0.225	t £/t
		Total Cost	65.25	£/Calf

Cake 3-10	months		
	565	kg in 3 mo	onths
7			
months			
=	565	х	2.3
	1299.5	kg 3-10 m	onths
@	238	£/t	
	Total Cost	309.28	£/calf

Other Feeds (Redman, 2018) £18 x 1.67

Vet & Med (Agricultural Budgeting and Costings, 2020) £24 x 220

Bedding (Agricultural Budgeting and Costings, 2020) £18.4 x 220

Misc. (Agricultural Budgeting and Costings, 2020) £10 x 220

## **Gross Margin**

Gross Output - Total Variable Costs

Appendix H- Further evaluation of a Rose Veal enterprise

A common topic of conversation and debate currently is centred around whether beef, as a food source, is sustainable. This has sparked the thought that traditional beef systems are bad for the environment and alternatives should be found to reduce the footprint of our food. Rose veal is a low carbon alternative to traditional beef making it a potentially good investment for the future.

Another benefit to this system is the security of where the stock will come from. Dairy bull calf production as a by-product of the dairy industry is much more stable then suckler beef production due to the margins that are in the contrasting systems. This means that the source of stock for this enterprise is more likely to survive then a suckler system if there is a mass reduction in ruminant production or beef consumption.

To make this enterprise more financially viable, a higher gross margin per calf needs to be obtained. To improve the gross margin per calf, either the gross output needs to be increased, or the variable costs need to be decreased.

Appendix I- DCF

Discounted Cashflow Budget

						Yea	ar					
Item	0	1	2	3	4	5	6	7	8	9	10	11
Income												
Meat Sales	0	23316	139392	139392	139392	139392	139392	139392	139392	139392	139392	
Value of stock	0	0	0	0	0	0	0	0	0	0	0	83635
Value of Building												13,856
Total	0	23316	139392	139392	139392	139392	139392	139392	139392	139392	139392	97491
Expenditure												
Purchased Calves	920	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	
Repairs		554	554	554	554	554	554	554	554	554	554	
Insurance		277	277	277	277	277	277	277	277	277	277	
Interest @ 4%		591	532	473	414	355	296	236	177	118	59	
Contract Charges		435.9	727	727	727	727	727	727	727	727	727	
Water + Electricity		1056	1760	1760	1760	1760	1760	1760	1760	1760	1760	
Variable												
Costs												
Conc. + Other Feeds		58678	97,797	97,797	97,797	97,797	97,797	97,797	97,797	97,797	97,797	
Vet & Med		3168	5,280	5,280	5280	5280	5280	5280	5280	5280	5280	
Bedding & Misc.		3749	6,248	6,248	6248	6248	6248	6248	6248	6248	6248	
Building	13,856											
Total	14776	79509	124175	124115	124056	123997	123938	123879	123820	123761	123702	0
NCF	-14775.5	-56193	15217	15277	15336	15395	15454	15513	15572	15631	15690	97491
Discount F	1	0.962	0.925	0.889	0.855	0.822	0.790	0.760	0.731	0.703	0.676	0.650
DCF	-14775.5	-54057	14076	13581	13112	12654	12209	11790	11383	10989	10607	63369

NPV

£104,936

## 10 years at 4% interest

First year Meat Sales= Calf sale value x calves bought per month x 4% mortality x 2 months (2 months' worth of calves sold due to the 10-month growing period meaning only 2 months have finished)

Value of Stock- Year 11= Value of annual calf sales x 0.6 for average value of calves in the system

Value of building year 11= 50% of Building Value year 0

Initial Purchase of Stock- Year 0= Value of calves x 1 x monthly calf purchases

Year 1 Concentrates & Other Feeds, Vet & Meds, Bedding & Miscellaneous, Contractor Charges, Labour and Electricity & Water= Annual Requirements from GM and Fixed Costs x 0.6 for unit only being at 0.6 capacity throughout the year.