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**OILSEED RAPEMEAL AS A
TURF FERTILISER**

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OILSEED RAPEMEAL AS A TURF FERTILISER

by

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ABBREVIATIONS

cm	centimetre
C:N	carbon:nitrogen ratio
CV%	Co-efficient of Variation
DM	dry matter
g	gram
GM	genetically modified
ha	hectare
K, K ₂ O	potassium, potash
kg	kilogram
l	litre
LA	Levington Agriculture Ltd
LSD	Least Significant Difference
m	metre
m ²	square metre
Mg	magnesium
mg/l	milligram/litre
ml	millilitre
mm	millimetre
NH ₄ -N	ammonium nitrogen
NO ₃ -N	nitrate nitrogen
NS	Not Significant
p	pence
P, P ₂ O ₅	phosphorus, phosphate
SAC	Scottish Agricultural Colleges
SE	Standard Error
t	tonne
wt	weight
+	significant at 0.10 probability level
*	significant at 0.05 probability level
**	significant at 0.01 probability level

ABSTRACT

Trials were carried out to evaluate the response of turf to oilseed rapemeal and composted rapemeal as nutrient sources, and as methods of moss control by Levington Agriculture Ltd and SAC. The financial viability of rapemeal as agricultural and horticultural fertilizers was assessed by SAC.

Oilseed rapemeal was mixed with water and placed in 80 litre controlled composting units. The rapemeal was successfully composted over a three month period during which time the mass was reduced by 50% and the nutrients concentrated. Before composting, analysis showed that the rapemeal had an abundance of nitrogen (6%) which could be released by microbial action, either during composting or in the field. After composting the ammonium-nitrogen content was high. The compost was air dried to make a spreadable product, and some ammonia would have been lost during this process. However, these ammonia losses could be recouped by a water trap and re-utilised in a commercial situation.

The rapemeal and composted rapemeal were tested against a standard inorganic fertilizer on fine turf at Levington, and ryegrass at Aberdeen by SAC. At the same total nitrogen rate (5 g nitrogen/m² [83.3 g product/m²]) the rapemeal was less effective than inorganic fertilizer. But at double rate (166.7 g/m²), the rapemeal grass colour was as good as the inorganic fertilizer after a short period during which the rapemeal protein was converted into available nitrogen. The composted rapemeal gave slightly greater initial visual effects than the rapemeal as the available nitrogen was already present, but as the protein had been converted, and some nitrogen lost as ammonia, the product could not sustain these effects and was therefore less effective overall. The second application of 83.3 g/m² rapemeal had a good effect on grass colour possibly due to a priming effect of the first application. After the first application, the inorganic treatment gave the greatest growth, followed by the rapemeal at 166.7 g/m², and then the composted rapemeal at the same rate. There was greater growth from one application of rapemeal at 166.7 g/m² compared to the split application (83.3 + 83.3 g/m²).

Following the summer work, the rate of the two rapemeal materials was increased from a total 10 g N/m² to 20 g N/m² to look at the effect of higher rates both as a fertiliser and for moss control. The grass colour responded most rapidly to the inorganic fertiliser followed by the composted rapemeal and then the rapemeal. At the end of December, the grass colour scores from the first two products were declining whereas the rapemeal maintained high colour scores. The grass was also most vigorous at the end of December from the rapemeal treatment. At Aberdeen the autumn was exceptionally wet and no benefits could be measured as even the standard product was ineffective at reducing moss cover.

A separate moss site was treated with rapemeal and composted rapemeal by Levington, with the rapemeal being as effective against moss as the standard commercial product. However, the grass growth in December was greater than would be desired by an amateur gardener who would need to cut the grass more. The rapemeal application rate in the autumn could therefore be cut back to 10-15 g N/m² equal to 166-250 g/m² of product. It is thought that the beneficial effects on the moss would still be as good at these rates.

The potential markets for rapemeal-based fertilizer are gardening, sports and recreation fields, organic farming and conventional agriculture. As a lawn care product, rapemeal offers benefits in terms of grass colour, growth and reduced moss. The retail cost of conventional fertilizers is 6p per m² for a spring fertilizer and 8p per m² for an autumn fertilizer containing mosskiller compared with the ingredient cost of 1.2p/m² for rapemeal at the optimum spring rate on turf, estimated at 167 g/m², and with rapemeal priced at £70/tonne. Accepting that there are packaging and marketing costs, this market, worth a total of £50m, would appear to offer good opportunities for around up to 25,000 tonnes/year. 11,000 ha (14%) of all sports and recreational fields may be suitable market for rapemeal which would utilise up to 5-10,000 t/year. Existing products with a similar chemical analysis market for around £400/t.

Rapemeal is currently acceptable as a fertilizer for organic farmers according to EC Regulation 2092/91. The area of organic land has increased rapidly and, taking the arable and horticulture sectors, approximately 19000 ha, and a light dressing of 20-30 kg N/ha, the market could currently

utilise up to 3000 – 10,000 t/ha at a value of £200/t. Conventional agriculture would value the nutrients in rapemeal at only £30/t excluding the sulphur, trace elements and organic matter benefits. Coupled with modern spreading pattern requirements rapemeal is therefore unlikely to be competitive unless e.g. pest and disease control or soil structure/water availability benefits can be demonstrated.

The price of rapemeal dropped by half in 2 years to a low of £54/t in 1998. The price of rapemeal is dominated by the production of soya. In 1998/99 almost 1m tonnes of rapemeal will be produced in UK. The amounts produced and utilised in feed mixes in the coming years are extremely difficult to predict until the Agenda 2000 reforms have been decided, and hence price prediction impossible. The profitable niche markets noted above could be penetrated but to have a significant effect on the tonnage produced, benefits in addition to nutrients for agricultural use would need to be demonstrated.

EXECUTIVE SUMMARY

Objectives

To evaluate the processing of rapemeal into fertilizer products, to demonstrate the products for use in high value markets using turf as a test crop, and to determine volumes and pricing of the various agricultural and horticultural markets.

Methods

The rapemeal was tested as a fertilizer using turf as the test crop. Rapemeal was used after sieving to less than 2mm or after composting to release some of the nutrients. Trials were conducted both at Levington and Aberdeen on fine grass and ryegrass respectively. In the autumn of 1998 the effects of applications on moss cover was assessed. SAC conducted the fertilizer market appraisal.

Composting

Oilseed rapemeal was mixed with water (45%:55% by weight) and placed in 80 litre controlled composting units. The rapemeal was successfully composted over a three month period during which time the mass was reduced by 50% and the nutrients concentrated.

The rapemeal had an initial analysis of 6% nitrogen, 1.2% phosphorus (2.7% P_2O_5) and 1.6% potassium (1.9% K_2O) in the dry matter. The moisture content was 12.5% before mixing, and the carbon:nitrogen ratio (C:N) was 7, indicating an abundance of nitrogen which could be released by microbial action, either during composting or in the field.

After composting the C:N ratio was still 7, and the ammonium-nitrogen content was high, approximately 17% of the total N. With a high pH, some nitrogen had probably been lost as ammonia. After air drying, the product had an analysis of 6% total nitrogen, 2% phosphorus (4.6% P_2O_5) and 2.1% potassium (2.5% K_2O). More ammonia would have been lost during air drying which was required to make a spreadable product for the turf trials, however, these ammonia losses could be recouped by a water trap and re-utilised in a commercial situation.

Further composting was carried out to provide material for autumn application.

Effects of rapemeal on turf as a fertilizer

The rapemeal and composted rapemeal were tested against a standard inorganic fertilizer on fine turf at Levington, and ryegrass at Aberdeen by SAC, in replicated field trials. At the same total nitrogen rate (5 g nitrogen/m² [83.3 g product/m²]) the rapemeal was less effective than inorganic fertilizer applied in May. But at double rate (166.7 g product/m²), the rapemeal grass colour was as good as the inorganic fertilizer allowing for a short period during which the rapemeal protein was converted into available nitrogen.

The composted rapemeal gave slightly greater initial effects than the rapemeal as the available nitrogen was already present, but as the protein had been converted, and some nitrogen lost as ammonia during composting, the product could not sustain these effects and was therefore less effective overall than rapemeal.

The second application of 83.3 g/m² rapemeal in July had a good effect on grass colour possibly due to a priming effect of the first application. A two application regime is therefore recommended with possibly an initial application of 166.7 g/m² followed by 83.3-166.7 g/m².

After the first application, the inorganic treatment gave the greatest grass growth, followed by the rapemeal at 166.7 g/m², and then the composted rapemeal at the same rate. There was greater growth from one application of rapemeal at 166.7 g/m² compared to the split application (83.3 + 83.3 g/m²).

Following the summer work, the rate of the materials was increased from 10 g N/m² to 20 g N/m² to look at the effect of higher rates both as a fertiliser and for moss control. The grass colour responded more rapidly to the inorganic fertiliser followed by the composted rapemeal and then the rapemeal. At the end of December, the grass colour scores from the first two products were declining whereas the rapemeal maintained high colour scores. The grass was also most vigorous at the end of December from the rapemeal treatment.

Effects on moss in turf

At Aberdeen the autumn was exceptionally wet and no benefits could be measured as even the standard product was ineffective at reducing moss cover.

A separate site was treated with rapemeal and composted rapemeal by Levington Agriculture in Suffolk, with the rapemeal being as effective against moss as a standard commercial autumn turf product. However, the grass growth in December was greater than would be desired by an amateur gardener who would need to cut the grass more. The rapemeal application rate in the autumn could therefore be cut back to 10-15 g N/m² equal to 166-250 g/m² of product. It is thought that the beneficial effects of moss cover reduction would still be as good at these rates.

The rapemeal was therefore shown to be an effective fertilizer for grass, with the additional benefit in the amateur application for moss control. Composting the rapemeal did improve the response time of the grass in terms of improved colour, but as nitrogen was lost during composting through volatilisation, effects were not adequately sustained. Composting for a much shorter period, interrupted by air drying mid-process, might give the benefits of both immediate response and slow release characteristics, with reduced composting costs.

Financial viability

The potential markets for rapemeal-based fertilizer are gardening, sports and recreation fields, organic farming and conventional agriculture. As a lawn care product, rapemeal offers benefits in terms of grass colour, growth and reduced moss. The retail cost of conventional fertilizers is 6p per m² for a spring fertilizer and 8p per m² for an autumn fertilizer containing mosskiller compared with the ingredient cost of 1.2p/m² for rapemeal at the optimum spring rate on turf, estimated at 167 g/m², and with rapemeal priced at £70/tonne. Accepting that there are packaging and marketing costs, this market, worth a total of £50m, would appear to offer good opportunities for around up to 25,000 tonnes/year.

11,000 ha (14%) of all sports and recreational fields may be suitable market for rapemeal which would utilise up to 5-10,000 t/year. Existing products with a similar chemical analysis market for around £400/t.

Rapemeal is currently acceptable as a fertilizer for organic farmers according to EC Regulation 2092/91. The area of organic land has increased rapidly and, taking the arable and horticulture sectors, approximately 19,000 ha, and a light dressing of 20-30 kg N/ha, the market could currently utilise up to 3000 – 10,000 t/ha at a value of £200/t. Conventional agriculture would value the nutrients in rapemeal at only £30/t excluding the sulphur, trace elements and organic matter benefits. Coupled with modern spreading pattern requirements rapemeal is therefore unlikely to be competitive unless e.g. pest and disease control or soil structure/water availability benefits can be demonstrated.

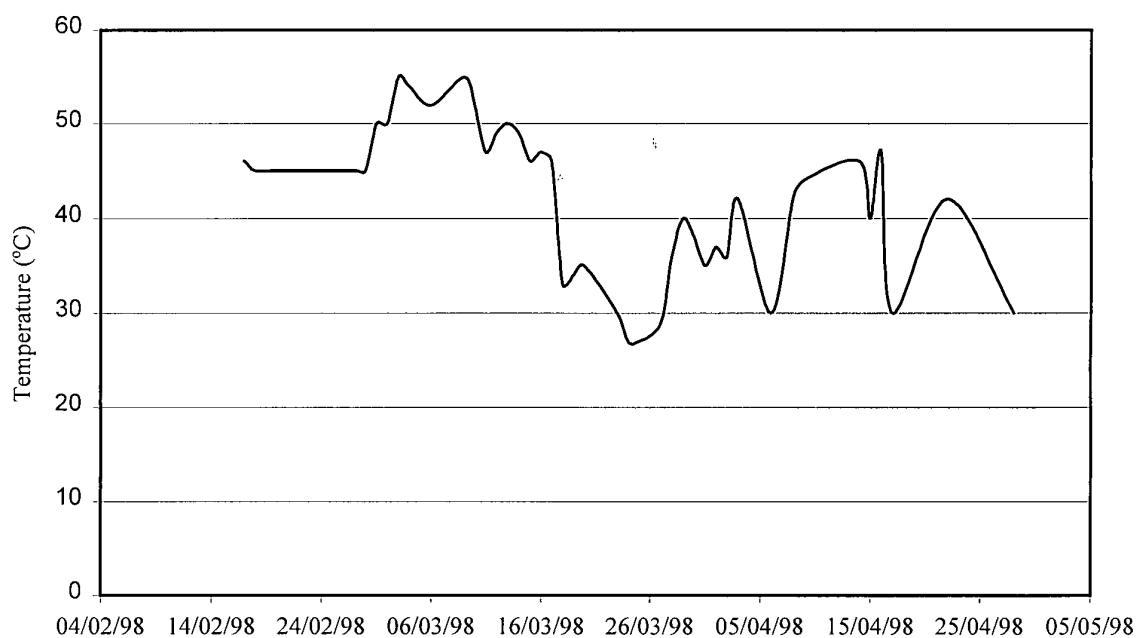
The price of rapemeal dropped by half in 2 years to a low of £54/t in 1998. The price of rapemeal is dominated by the production of soya. In 1998/99 almost 1m tonnes of rapemeal will be produced in UK. The amounts produced and utilised in feed mixes in the coming years are extremely difficult to predict until the Agenda 2000 reforms have been decided, and hence price prediction impossible. The profitable niche markets noted above could be penetrated but to have a significant effect on the tonnage produced, benefits in addition to nutrients for agricultural use would need to be demonstrated.

Section 1 Trials of rapemeal as a Fertilizer

1.1 Composting

Composting was carried out on a small scale at Levington Agriculture. Oilseed rapemeal was mixed with water at a 45:55 rapemeal to water ratio by weight. The composting materials were transferred to 80 litre composting units, where airflow and heating were controlled as required. The rapemeal was successfully composted over a three month period during which time the material reached temperatures of over 50°C for ten consecutive days (see Figure 1) before falling and fluctuating between 30 and 45°C. The increase in temperature after a month was due to the remixing of the compost. Over the three month period, the mass was reduced by 50% and the nutrients concentrated. The compost was turned out to dry, and then sieved for use in turf trials.

Figure 1 Compost Temperature Profile



The rapemeal had an initial analysis of 6% nitrogen, 1.2% phosphorus (2.7% P_2O_5) and 1.6% potassium (1.9% K_2O) in the dry matter (see Table 1). The moisture content was 12.5% before mixing, and the carbon:nitrogen ratio (C:N) was 7, indicating an abundance of nitrogen which could be released by microbial action, either during composting or in the field.

Table 1.1 Analysis of Materials

	Units	Oilseed rapemeal	Composted rapemeal
Bulk density	g/l	498	526
Moisture content	%	12.5	59
pH		6.1	8.8
Conductivity	$\mu\text{S}/\text{cm}$	2500	4400
Organic carbon	% DM	39	41.5
C:N ratio		7	7
Water extractables			
NH ₄ -N	mg/l		3300
NO ₃ -N	mg/l		6
P	mg/l		50
K	mg/l		3816
Mg	mg/l		48
Total N (dry)	% DM	5.96	5.99
Total P	% DM	1.19	2.00
Total K	% DM	1.57	2.12
Total N (wet)	% DM		8.78
Total P	% DM		2.24
Total K	% DM		2.24

After composting the C:N ratio was still 7, and the ammonium-nitrogen content was high, approximately 17% of the total N. With a high pH, some nitrogen had probably been lost as ammonia during composting. Analysis of a wet sample without air drying pre-extraction indicated a nitrogen content of almost 9% N. After air drying, the product had an analysis of 6% total nitrogen, 2% phosphorus (4.6% P₂O₅) and 2.1% potassium (2.5% K₂O), indicating that more ammonia had been lost during air drying. However, these ammonia losses could be recouped by a water trap and re-utilised in a commercial situation. Air drying was required to create a spreadable product in practice.

A second batch of composting was carried out over a 2 month period to provide material for autumn application. The analysis of the material was similar to that found earlier in the year.

1.2 Effects of rapemeal on turf as a fertilizer

The response of turf to the application of oilseed rapemeal and composted rapemeal, and their effect on moss was evaluated by comparison with a standard inorganic spring fertilizer. From the analysis of the rapemeal and the composted material, the following rates were applied according to their total nitrogen (N) content. Treatments were applied by hand to plots which were 4 m x 1.5 m. Following the summer work, the autumn applications were made at higher rates to improve effects and to assess for moss control, and compared with a standard autumn fertilizer at a lower N rate, but containing iron sulphate which greens up the grass.

Table 1.2 Treatment List

Treatment	No. of applications	Rate of application - g/m ² [g N/m ²]		
		May	July	October
1. Control	nil			
2. Rapemeal	2	83.3 [5]		333.3 [20]
3. Rapemeal	2	83.3 [5]	83.3 [5]	
4. Compost	2	83.3 [5]		333.3 [20]
5. Compost	2	83.3 [5]	83.3 [5]	
6. Rapemeal	1	166.7 [10]		
7. Compost	1	166.7 [10]		
8. Inorganic fertilizer	3	50 [5]	50 [5]	35 [2.1]

Two trials were conducted, by Levington Agriculture in Suffolk and by SAC in Aberdeen, on fine turf and ryegrass swards, respectively. Each treatment was replicated four times and the trials were of randomised block design and analysed accordingly. Treatment means have been compared using LSD (0.05); Duncan's multiple range test letter codes are also shown in the tables. Wet and dry grass weights per plot were recorded weekly. Assessments were made for colour, and (at Aberdeen) for moss cover and kill after October. The trials were monitored until the end of December 1998.

A further trial was conducted in Suffolk to assess the effects of rapemeal and composted rapemeal on moss control. The replicated trial was carried out on lawn grass with uniform moss present. Treatments were applied in October, and the site was assessed for moss cover, moss kill and colour and vigour of the grass for two months.

<u>Application dates</u>	<u>Levington</u>	<u>Aberdeen</u>
May	20 May	22 May
July	19 July	24 July
October	20 October	23 October

1.21 Spring and summer applications -grass colour

At both sites, the inorganic fertiliser gave a fast response in colour score after the first application, but the colour score declined over time until the next application. The colour scores produced by the rapemeal at 83.3 g/m² were low initially, but increased as the nitrogen was released over time. The rapemeal at 166.7 g/m² was as effective as the inorganic fertiliser at Levington. The composted rapemeal had a more immediate effect on grass colour as the organic nitrogen was already available compared with the uncomposted rapemeal. However, the grass colour was not sustained by the compost. The higher rate of compost was more effective than the lower rate, but was not as effective as the rapemeal.

The effects seen after the second application were similar to those after the first.

1.22 Spring and summer applications - grass dry matter yields

After the first application at Levington, the inorganic fertiliser produced the greatest cumulative dry weights followed by the rapemeal at 166.7 g/m², and then the composted rapemeal at the same rate. The 166.7g/m² rates of rapemeal and the compost were more effective than the 83.3 g/m², and all applications produced greater dry matter yields than the control. Higher dry matter yields were achieved from the single application of rapemeal than from the split application. The grass was more vigorous where the inorganic fertiliser was applied than the other treatments. Similar results were seen at the Aberdeen site.

Table 1.3 Levington site after 1st application – colour scores and cumulative grass dry weight

		27/5/98	3/6/98	10/6/98	17/6/98	2/7/98	16/7/98	total grass
	g/m ²							wt. g/m ²
Control	-	3.4 ab	2.3 a	2.3 a	2.4 a	2.3 a	2.1 a	29.7 a
Rapemeal	83	3.3 a	3.4 b	3.5 b	4.1 c	3.5 bc	3.3 b	39.3 b
Rapemeal	83	3.4 ab	3.8 b	3.6 b	4.4 c	3.8 bc	3.3 b	39.3 b
Compost	83	3.9 abc	3.4 b	3.6 b	3.3 b	3.4 b	3.1 b	38.6 b
Compost	83	4.0 bc	3.6 b	3.5 b	3.5 b	3.0 ab	3.4 b	38.8 b
Rapemeal	167	4.3 bc	6.9 d	6.9 d	6.8 d	6.0 d	4.4 c	56.8 c
Compost	167	4.8 d	4.9 c	4.8 c	4.4 c	4.3 c	3.6 b	43.2 b
Inorganic	50	6.8 e	7.9 e	7.4 d	6.8 d	5.5 d	4.5 c	66.4 d
LSD (0.05)		0.6	0.7	0.5	0.6	0.8	0.6	4.8
Sig.		**	**	**	**	**	**	**
SE/plot		0.414	0.450	0.349	0.419	0.536	0.414	3.263

Table 1.4 Aberdeen site after 1st application – colour scores and cumulative grass dry weight

		4/6/98	18/6/98	2/7/98	16/7/98	total grass
	g/m ²					wt. g/m ²
Control	-	6.0 a	5.0 a	5.0 a	5.0 a	77.6 a
Rapemeal	83	6.3 ab	5.8 bc	6.0 b	5.8 bc	85.7 ab
Rapemeal	83	6.3 ab	5.8 bc	6.5 b	6.0 c	78.3 a
Compost	83	6.5 abc	5.0 a	5.0 a	5.3 ab	76.7 a
Compost	83	6.0 a	5.3 ab	5.0 a	5.3 ab	78.4 a
Rapemeal	167	6.8 bc	7.5 d	8.0 c	7.0 d	104.4 cd
Compost	167	7.0 c	6.3 c	6.3 b	6.0 c	96.1 bc
Inorganic	50	9.0 d	8.0 d	7.8 c	6.8 d	109.7 d
LSD (0.05)		0.5	0.5	0.6	0.5	10.5
Sig.		**	**	**	**	**
SE/plot		0.372	0.370	0.430	0.362	7.122

Table 1.5 Levington site after 2nd application – colour scores and cumulative grass dry weight

		31/7/98	17/8/98	28/8/98	21/9/98	2/10/98	20/10/98	total grass
	g/m ²							wt. g/m ²
Control	-	2.3 a	2.4 a	3.0 a	3.6 a	3.0 a	3.6 a	54 a
Rapemeal	83	3.0 b	3.0 a	3.3 ab	4.0 ab	4.0 bc	3.9 a	67 b
Rapemeal	83+83	4.4 c	6.4 c	5.8 c	5.6 c	5.0 d	5.0 b	81 c
Compost	83	2.9 b	3.0 a	3.3 ab	4.0 ab	4.0 bc	4.1 a	67 b
Compost	83+83	4.5 c	4.5 b	4.1 b	4.6 b	4.1 bcd	4.8 b	73 b
Rapemeal	167	4.1 c	4.0 b	3.9 ab	4.4 ab	4.4 bcd	4.6 b	90 d
Compost	167	3.3 b	3.0 a	3.3 ab	4.1 ab	3.9 ab	4.1 a	71 b
Inorganic	50+50	8.8 d	8.0 d	6.8 d	5.8 c	4.9 cd	4.8 b	128 e
LSD (0.05)		0.5	0.7	0.9	0.9	0.9	0.5	7.8
Sig.		**	**	**	**	**	**	**
SE/plot		0.360	0.504	0.579	0.589	0.611	0.326	5.375

Table 1.6 Aberdeen site after 2nd application – colour scores and cumulative grass dry weight

		30/7/98	14/8/98	27/8/98	10/9/98	24/9/98	8/10/98	total grass
	g/m ²							wt. g/m ²
Control	-	5.0 a	4.0 a	5.0 a	6.5 a	6.8 a	7.0 b	162 ab
Rapemeal	83	5.3 a	4.5 a	5.3 ab	6.5 a	7.0 a	7.0 b	173 ab
Rapemeal	83+83	7.0 c	8.0 c	7.8 c	7.8 b	7.0 a	7.0 b	179 bc
Compost	83	5.3 a	4.5 a	5.3 ab	6.5 a	6.8 a	7.0 b	157 a
Compost	83+83	6.0 b	4.5 a	5.5 ab	6.8 a	6.8 a	7.0 b	168 ab
Rapemeal	167	6.0 b	5.3 b	6.0 b	7.0 ab	7.0 a	7.0 b	210 d
Compost	167	5.5 ab	4.5 a	6.0 b	6.5 a	7.0 a	7.0 b	195 cd
Inorganic	50+50	9.0 d	9.0 d	8.0 c	6.5 a	8.0 b	6.25 a	245 e
LSD (0.05)		0.6	0.7	0.7	0.8	0.4	0.3	19
Sig.		**	**	**	**	**	**	**
SE/plot		0.423	0.458	0.496	0.546	0.301	0.177	13.1

1.23 Autumn applications - grass colour

After the third application, at the Levington site, the high rate of compost had a more immediate effect on colour scores than the rapemeal. By the end of December the rapemeal was giving the darkest grass colour in comparison with the compost and the inorganic fertiliser. At the Aberdeen site the autumn was very wet which probably resulted in the available nitrogen being leached, and so the slow release rapemeal gave the best colour scores.

1.24 Autumn applications - grass dry matter yields

After the autumn application the grass at Levington responded well to the additional treatments. The inorganic fertiliser produced the greatest initial growth effects. However, in December the rapemeal gave excessive responses, which would result in the grass having to be cut too often for an amateur gardener. The compost was intermediate in its effects. At Aberdeen the grass growth was also greatest from the rapemeal treatment, followed by the inorganic fertiliser.

Table 1.7 Levington site after autumn application – colour scores

		27/10/98	13/11/98	27/11/98	10/12/98	21/12/98
	g/m ²					
Control	-	3.5 a	2.0 a	2.4 a	2.0 a	2.1 a
Rapemeal	83 +333	4.8 cd	7.4 cd	8.1 c	8.0 c	8.0 e
Rapemeal	83+83	5.0 d	3.1 b	3.6 b	3.0 b	3.1 bc
Compost	83 +333	6.4 e	7.1 c	8.5 cd	8.5 cd	6.6 d
Compost	83+83	4.4 bc	3.1 b	3.5 b	3.0 b	3.4 c
Rapemeal	167	4.4 bc	2.6 b	3.3 b	2.6 b	2.9 b
Compost	167	4.0 ab	2.6 b	2.9 ab	2.5 ab	2.8 b
Inorganic	50+50+21	7.5 f	7.9 d	9.0 d	9.0 d	6.6 d
LSD (0.05)		0.6	0.5	0.8	0.6	0.4
Sig.		**	**	**	**	**
SE/plot		0.392	0.352	0.510	0.400	0.289

Table 1.8 Levington site after autumn application – dry weights

		4/11/98 grass	21/12/98 grass	total year grass
	g/m ²	wt. g/m ²	wt. g/m ²	wt. g/m ²
Control	-	9.4 a	6.2 a	339 a
Rapemeal	83 +333	12.4 bc	32.7 d	449 b
Rapemeal	83+83	14.9 c	9.9 b	511 c
Compost	83 +333	13.6 bc	20.7 c	437 b
Compost	83+83	12.9 bc	8.5 ab	458 b
Rapemeal	167	12.4 bc	8.5 ab	559 c
Compost	167	11.0 ab	7.1 ab	446 b
Inorganic	50+50+21	27.7 d	19.3 c	814 d
LSD (0.05)		2.6	2.6	49
Sig.		**	**	**
SE/plot		1.764	1.766	33.42

Table 1.9 Aberdeen site after autumn application – colour scores and grass dry weights

		20/11/98	11/12/98	24/12/98	Autumn grass	total year grass
	g/m ²				wt. g/m ²	wt. g/m ²
Control	-	5.0 a	5.8 a	5.0 a	4.0 a	166 a
Rapemeal	83 +333	7.0 c	9.0 d	9.0 d	8.1 c	181 ab
Rapemeal	83+83	5.0 a	5.8 a	5.0 a	5.1 ab	184 ab
Compost	83 +333	5.8 b	7.3 b	6.3 b	5.5 ab	163 a
Compost	83+83	5.0 a	5.8 a	5.0 a	4.8 ab	173 a
Rapemeal	167	5.3 a	6.0 a	5.0 a	5.0 ab	215 c
Compost	167	5.0 a	6.3 a	5.0 a	4.4 a	199 bc
Inorganic	50+50+21	7.0 c	8.0 c	7.5 c	6.4 b	251 d
LSD (0.05)		0.4	0.6	0.4	1.5	20
Sig.		**	**	**	**	**
SE/plot		0.267	0.403	0.259	1.005	13.4

1.3 Results for Moss Control (Tables 1.10-1.14)

Moss cover was assessed at the Aberdeen site after the autumn application, but due to very wet conditions moss control effects were not found, even from the inorganic standard.

At Levington, true moss kill was seen almost immediately on plots treated with the inorganic fertiliser containing iron. The rapemeal and compost showed slight effects of moss kill.

Moss cover increased on the untreated plots over time as autumn progressed. Moss cover decreased on the plots treated with rapemeal and the inorganic fertiliser. The compost had some effect at decreasing moss cover, but was not as effective as the rapemeal.

The colour scores were greatest from the inorganic fertiliser, followed by the rapemeal, then the compost. The rapemeal produced the most vigorous grass. The compost produced grass of similar vigour to the inorganic standard.

Moss control was achieved by the rapemeal due to some limited kill, and by covering the moss, thereby encouraging the grass to compete with the moss. The benefit of improved turf appearance is possibly compromised by a greater requirement for grass cutting after application of the rapemeal which may be unattractive to potential users during late autumn and winter. This is not such a disadvantage in the spring and the effects of the slow release nutrients from the rapemeal compared with inorganic fertilizer must also be taken into consideration.

A suitable rate of rapemeal for application to turf where moss is present may be 333 g/m² in the spring but reduced to 250 g/m² in the autumn.

Table 1.10 Levington moss trial - grass colour scores

		20/10/98	27/10/98	2/11/98	17/11/98	1/12/98	16/12/98
	g/m ²						
Untreated	-	4.25 a	5.25 a	4.50 a	4.38 a	3.25 a	4.25 a
Rapemeal	333	4.50 a	6.25 b	6.25 b	6.38 b	7.38 c	8.00 c
Compost	333	4.13 a	6.38 b	5.50 ab	6.50 b	5.75 b	6.25 b
Inorganic	35	4.38 a	8.00 c	8.13 c	7.63 c	8.75 d	9.00 d
LSD (0.05)		0.516	0.824	1.036	0.926	0.629	0.422
Sig.		NS	**	**	**	**	**
SE/plot		0.323	0.515	0.647	0.579	0.393	0.264

Table 1.11 Levington moss trial - grass vigour scores

		17/11/98	1/12/98	16/12/98
	g/m ²			
Untreated	-	4.25 a	1.00 a	2.50 a
Rapemeal	333	7.00 c	4.75 c	6.38 c
Compost	333	5.38 b	2.75 b	4.63 b
Inorganic	35	8.57 b	2.75 b	4.13 b
LSD (0.05)		0.537	0.400	0.570
Sig.		**	**	**
SE/plot		0.336	0.250	0.356

Table 1.12 Levington moss trial - moss kill

		27/10/98	2/11/98	17/11/98
	g/m ²			
Untreated	-	0.00 a	0.00 a	0.00 a
Rapemeal	333	0.00 a	12.50 b	1.25 a
Compost	333	7.00 b	7.50 ab	1.25 a
Inorganic	35	52.5 c	55.75 c	27.00 b
LSD (0.05)		5.392	8.923	6.190
Sig.		**	**	**
SE/plot		3.371	5.578	3.869

Table 1.13 Levington moss trial – moss % cover

		20/10/98	17/11/98	1/12/98	16/12/98
	g/m ²				
Untreated	-	30.38 a	40.63 b	38.88 c	41.50 b
Rapemeal	333	30.25 a	21.69 a	12.81 a	24.38 a
Compost	333	27.63 a	30.44 a	25.25 b	31.25 ab
Inorganic	35	31.81 a	22.25 a	15.94 ab	23.19 a
LSD (0.05)		5.789	9.897	11.855	11.885
Sig.		NS	**	**	**
SE/plot		3.619	6.187	7.411	7.430

Table 1.14 Aberdeen moss trial - moss % cover

		23/10/98	6/11/98	20/11/98	11/12/98	24/12/98
	g/m ²					
Control	-	50.00 b	56.25 c	56.25 a	66.88 c	70.00 b
Rapemeal	83 +333	28.13 ab	49.38 bc	51.88 a	42.50 abc	43.13 ab
Rapemeal	83+83	31.25 ab	31.25 abc	36.25 a	37.50 ab	41.88 ab
Compost	83 +333	28.75 ab	46.25 abc	40.63 a	49.38 bc	50.00 ab
Compost	83+83	39.39 ab	43.13 abc	54.38 a	54.38 bc	58.13 b
Rapemeal	167	29.38 ab	28.13 ab	30.63 a	52.50 bc	36.88 ab
Compost	167	30.63 ab	30.00 abc	33.75 a	50.00 bc	46.25 ab
Inorganic	50+50+21	17.50 a	21.25 a	26.25 a	20.00 a	20.63 a
LSD (0.05)		20.132	24.696	29.205	24.539	29.992
Sig.		NS	+	NS	*	+
SE/plot		13.690	16.794	19.860	16.687	20.395

1.4 Conclusions

- Rapemeal is an effective slow release nitrogen fertilizer for turf, also containing other major nutrients;
- Composting the rapemeal by itself converted some of the organic nitrogen into plant available forms but at the risk of losing nitrogen through volatilisation and reducing the persistence of effects;
- At 166 g /m² rapemeal was an effective spring and summer fertilizer for turf, with higher rates likely to be beneficial where moss is present;
- At 166-250 g/m² rapemeal was an effective autumn fertilizer for turf, with the higher rate likely to suppress moss.

Section 2 The Financial Viability of Rapemeal as a Fertiliser

The financial viability of rapemeal as a fertiliser depends on a number of factors. Possible markets, oilseed production, competing uses and production costs are now examined to estimate the potential margins from rapemeal fertiliser.

2.1 The Market for Rapemeal Based Fertiliser

Rapemeal fertiliser could be sold into a number of markets:

- Gardening;
- Sports and recreation fields;
- Organic farming; and,
- Conventional agriculture

2.1.1 Gardening

The UK gardening market is a large and generally buoyant market sector. In 1997 the consumer garden products market was worth £2,684 million, of which garden chemicals accounted for £320 million (Consumer Goods UK, 1998). The term garden chemicals includes growing media (composts, peat, mulches), fertilisers and lawncare consumables, pesticides and herbicides. The growth of this sector is shown in Table 2.1.

Table 2.1 Sales of garden chemical products, 1993-1997 (£ million)

	1993	1994	1995	1996	1997	% change 1993/97
Growing media	121	122	130	140	152	26
Fertilisers	66	70	80	85	90	36
Pesticides / herbicides	54	60	66	72	78	44
Total	241	252	276	297	320	33

Source: Corporate Intelligence on Retailing estimates.

The potential for rapemeal as a growing media is limited. Essentially this market covers composts, growing bags and mulches. Unfortunately, rapemeal in its natural state forms an unattractive surface fungus which attracts sciarid flies as it decomposes. Overcoming this problem may be achieved through pre-composting, though further research would be necessary to confirm this. Setting aside the physical problems of rapemeal as a growing media, there are sound financial reasons for avoiding this sector. Competition is intense particularly in the growing bag market, with prices having fallen from £1.50-2.00 to 99p or lower per bag.

By contrast, the garden fertiliser market offers better prospects for rapemeal. Fertiliser sales have grown by 36 per cent since 1993, reaching £90 million in 1997, though price increases, rather than greater sales, account for most of this growth.

Lawn care fertiliser is most important, accounting for 63 per cent of the market. Given that only 10 per cent of lawn owners are currently thought to buy a lawn treatment product annually, the potential for increased sales seems good. Moreover, the amateur gardener has tended to expand the area of lawns by grassing over herbaceous borders.

The potential for developing rapemeal as a lawn care fertiliser may therefore be good, given its relatively low nitrogen content and long acting nature. However, the increasing sophistication of lawn care products may require that further processing of rapemeal to enhance its characteristics is necessary. Prices for some of the main lawn care fertilisers in 1998/99 are shown below.

Table 2.2 Fertiliser Prices 1998/99

	Quantity	Price (£)	Action	Price p/m ²
Levington Autumn Extra	100 m ²	8.00	autumn feed and moss kill	8.0
Levington Lawn Food	100 m ²	6.00	instant spring feed	6.0
Grasshopper triple action	80 m ²	6.50	weed, feed and moss kill	8.1
Scotts Lawn Builder	100 sq m	7.00	feed with slow release	7.0

Source: Levington Agriculture survey Spring 1999

By contrast, the non-lawn care market for fertiliser is increasingly moving to liquid concentrates. Rapemeal would appear unsuited to this market.

Other gardening markets may also have potential. These range from local authorities to the Commonwealth War Graves Commission. Whilst it is difficult to accurately assess the size of the 'public' gardening sector, it should be significant given the increasing importance attached to landscape appearance by tax payers and tourists. The environmentally friendly nature of rapemeal fertiliser, should also score well in this market.

2.1.2 Sports and recreation fields

This market covers a wide range of public and private sports areas. Of these, the most important are football, rugby, cricket, hockey pitches, plus golf courses, along with more specialist areas like tennis courts and bowling greens. All are important users of fertilisers. However, in its present form rapemeal is less suitable for use on fine turf areas like tennis courts, bowling and golf greens. Moreover, most parkland golf courses do not need extra fertiliser because of the inherent fertility of their soils. Therefore, only sports pitches and low fertility golf courses (links and heathland) are considered below.

Recreation pitches and golf courses cover a large land area. Based on a 1993 survey of pitches in England by the Institute of Groundsmanship, there were 60,704 hectares of pitches or 13.02 sq metres per head of the English population (Wynn, pers com, 1999). Assuming that a similar area be available to each person in Scotland, Northern Ireland and Wales, the total area of pitches in the UK should be around 77,000 hectares. Gauging the area of low fertility fairways on links and heathland courses is far more difficult. A very tentative estimate, based on the number of courses in the UK, gives a figure of around 11,000 hectares.

The fertility management of this type of land is quite standard with an application of a long acting, slow release, nitrogen rich fertiliser in the spring, with a follow up dressing in mid summer to ensure a steady release of nutrients throughout the growing season. Quick release nitrogen fertilisers are not desirable because of the increased cost of application and the environmental implications of leaching. As an organic fertiliser, rapemeal would seem ideally suited for this market. Though the suitability of rapemeal for use through currently available spreaders may be a limitation.

The fertiliser requirements of pitches/fairways are generally much lower than fine turf areas like golf and bowling greens. Though top quality surfaces in major stadiums have a much higher requirement than local authority pitches as shown in Table 2.3.

Table 2.3 Coarse turf nutrition

Pitch type	Application rate - kg / ha / yr		
	N	P	K
Local Authority, school, clippings returned, loam	35-45	5-10	10-20
As above but sandy rootzone. Plus links fairways	45-65	15-25	20-40
Major stadium, free draining, clippings removed, irrigated, intensive use	160-240	60-90	140-200

(Source: C.Smith, pers.com, 1999)

The market for turf fertilisers is very competitive. Two widely available fertilisers are Terralift Outfield Pellets (6N.2P.4K) and Mascot Organic Pellets (8N.2P.4K) which sell at around £400 per tonne. General agricultural fertilisers are also widely used for lifting phosphate reserves and correcting pH levels. Though typical agricultural nitrogen fertilisers are not popular because of their quick, but short, response nature.

The potential size of the playing pitch/fairway fertiliser market is estimated below based on a range of application rates.

Table 2.4 The potential market for rapemeal fertiliser on sports pitches and low quality golf fairways in the UK

Area	Application rate (kg N per ha)					
	30 kg N		40 kg N		50 Kg N	
	Tonnes Per ha	Tonnes Total	Tonnes Per ha	Tonnes Total	Tonnes Per ha	Tonnes Total
Pitches area 77,000 ha	0.5	38,500	0.666	51,282	0.833	64,141
Low fertility golf fairways 11,000 ha	0.5	5,500	0.666	7,326	0.833	9,163

Clearly, this market has significant potential. The inherent properties of rapemeal make it well suited to use on coarse turf. Its organic nature may be a particularly useful marketing advantage especially for environmentally aware local authorities. But competition is strong in this well established market and invariably purchasers, like local authorities, are subject to tight financial budgets. Also, some further processing may be needed to produce a product of suitable standard for application by current technology.

2.1.3 Organic Farming

Rapemeal is currently acceptable as a fertiliser for organic farmers according to EC Regulation 2092/91. Whilst the situation may change, particularly given mounting concern about genetically modified crop by-products accidentally being used on organic farms, estimating the potential size of this market is worthwhile.

According to the UK Register of Organic Food Standards (UKROFS), the official area of organic land at the end of July 1998 was 63,111 hectares, an increase of 87 per cent since February 1995 (Lampkin and Measures, 1999). This area has since expanded to 78,508 hectares (Crofts, pers com, 1999). According to a 1998 survey by the Soil Association, land use in the organic sector comprises 75 per cent grassland, 18 per cent arable, 6 per cent horticulture and 1 per cent fruit.

Purchased fertiliser use on organic farms is very low compared to conventional agriculture. This, of course, is to be expected as a key aim of organic husbandry is to protect the long term fertility of soils by maintaining organic matter levels through recycling organic materials like crop residues and

livestock manures. Where crop nutrients are introduced into the system, these should be relatively insoluble, which are made available to the plant by the action of soil micro-organisms. So whilst purchased fertiliser inputs into the organic sector will be limited, rapemeal should be acceptable given its characteristics, including biocidal properties.

The main types of fertilisers and soil improvers used by organic farmers are noted in Table 2.5. It should be noted that some products may only be used on a restricted basis, subject to the approval of the relevant certifying body.

Table 2.5 Types and prices of compound organic fertilisers

Product	Analysis				Price
	N %	P %	K %	Ca %	£ per t
Complete organic	5	5	5	-	245-260
Complete organic	5	3	3	-	180-200
Cumulus K	0.75	1	13	-	210-230
Fish meals	7	6	-	16	420-440
Fish meals (restricted use)	4.5	7	5	-	260-270

Source: Organic Farm Management Handbook, 1999.

The need for purchased fertiliser will vary with farm type. Livestock farms, especially in the uplands and hills, are generally low users. Legumes, livestock manure, plus lime and rock phosphate applied on a rotational basis, are the main sources of nutrients on all grassland farms. Potash is perhaps the major concern, as reserves are significantly depleted with silage / hay crops. Unfortunately rapemeal is not particularly rich in potash. On mixed and cropping farms fertility depends on careful management of crop rotations in addition to the sources available to grassland farms. Rapemeal should be a suitable additional source of nutrients on such farms. One particular use may be as a strategic nitrogen application on winter cereals in the spring.

Assuming that rapemeal is used only on the current area of arable and horticultural crops, the following tonnages of rapemeal are calculated for three rates of application:

Table 2.6 The potential market for rapemeal fertiliser on UK organic farms

Area	Application rate (kg N per ha)					
	10 kg N		20 kg N		30 Kg N	
	Tonnes Per ha	Tonnes Total	Tonnes Per ha	Tonnes Total	Tonnes Per ha	Tonnes Total
Crop area 18,842 ha (ie, 24% of 78,508 ha)	0.167	3,146	0.333	6,274	0.500	9,421

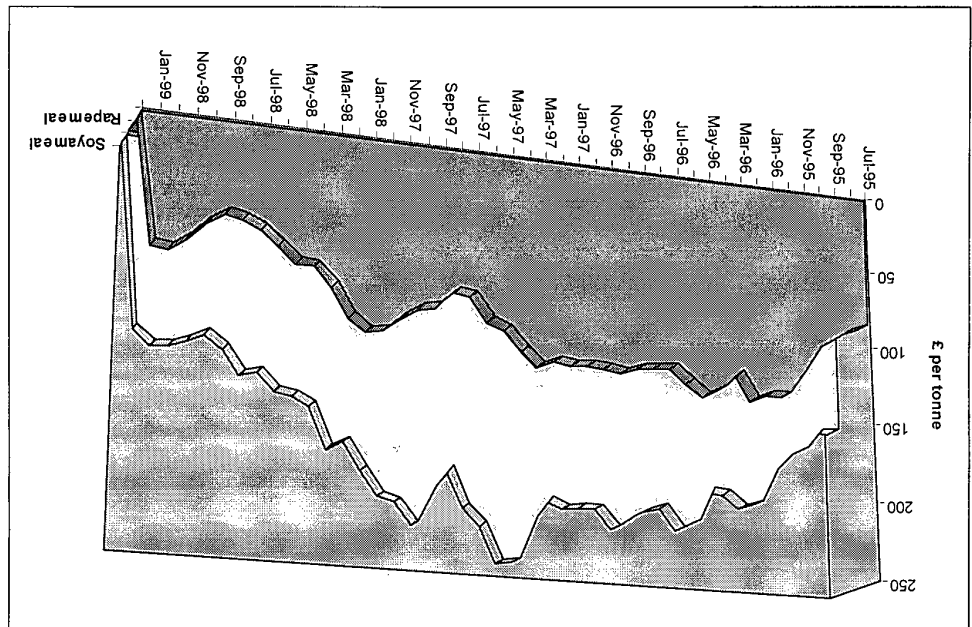
If it is further assumed that the area of organic farming continues to grow rapidly, the organic market may be a small but significant market for rapemeal. However, rapemeal would have to compete with organic compound fertilisers already on the market, and be in a form suitable for application by conventional fertiliser spreaders. What's more, given the likely difficulty of guaranteeing that rapemeal does not include genetically modified material, the possibility of this product being excluded from the organic market cannot be ruled out although high erucic acid rapemeal is processed separately and hence GM rapemeal could be excluded. Meal from GM varieties could, if traded at a sizeable discount, make it suitable for conventional agriculture as a general fertilizer.

Currently, rapemeal is very unlikely to be used in conventional farm systems. Such systems require much more concentrated levels of nitrogen, phosphate and potash. Competition from inorganic fertilisers is extremely intense and based largely on cost. On a per unit basis, the nitrogen, phosphate and potash used in conventional agricultural fertilisers costs around 29p, 34p and 20p per kilogram respectively (SAC Farm Management Handbook, 1998). At these prices rapemeal would be valued at just over £30 per tonne. Other benefits would need to be demonstrated including the value of the sulphur, trace element and organic matter contents, the effects on soil structure and water holding capacity and pesticidal effects. Application may also be a problem given the common types of fertiliser spreaders used in the industry, although it could be spread by pneumatics.

2.2 The Price of Rapemeal

The economics of using rapemeal as a fertiliser depends largely on the cost of buying it from the crushers (processing plants). As shown in Figure 2.1, the rapemeal price collapsed in 1998 to a low point of just £54 per tonne. This compares to a peak of £138 per tonne in early 1996. Prices remain depressed.

Figure 2 - Rapemeal and Soyameal prices 1995-99



To explain why prices are so depressed and consequently suggest how the price might change in future, an appreciation is required of the factors driving the rapemeal price.

2.2.1 Worldwide production of oilseeds

US predictions suggest that world oilseeds production in 1998/99 will exceed last year's record of 285.16 t (Agra Europe, 1999). Soyabeans are the most important crop accounting for more than half the total, and dominate world trade in oilseeds. Table 2.7 gives a breakdown of expected oilseed production.

Table 2.7 Oilseed harvests in principal production regions (t) 1998/99

	Soyabeans	Rape	Sunflower seed
USA	75.03	0.66	2.10
Brazil	31.60	-	-
Argentina	18.90	-	7.03
EU	1.84	9.66	4.26
Canada	2.74	7.59	-
China	13.50	8.20	1.25
India	5.70	6.02	1.35
Russia	0.26	0.08	2.70

Figures estimated.

Source: USDA and National Statistics

In marked contrast to the US, oilseed rape is the dominant oil crop grown in the EU followed by sunflower seed. Because of climatic conditions, no commercial production of soya or sunflower seed is possible in the UK. So apart from a small area of linseed only oilseed rape is grown. As the following table shows, UK production of oilseed rape has expanded significantly over the past four years, albeit after declining in the early 1990's because of farm policy reforms. With farmers across the rest of the Europe also expanding production, the 1998 crop was a record.

Table 2.8 UK Oilseed Rape Supply and Demand

'000 tonnes	95/96	96/97	97/98(iv)	98/99(v)
Production (i)	1,234	1,410	1,525	1,545
Area ('000ha)	439	414	472	533
Yield (t/ha)	2.81	3.41	3.23	2.90
Imports	419	291	359	350
Total Supply (ii)	1,654	1,719	1,882	1,900
Crush	1,473	1,378	1,557	1,610
Other (iii)	49	89	160	140
Total Use	1,522	1,467	1,699	1,795
Exports	98	233	145	150

(i) Includes rapeseed grown on set-aside land for industrial use.

(ii) Net of waste.

(iii) Includes; seed, waste, stocks not held with crushers and usage of whole seed in animal feed.

(iv) Estimate.

(v) Forecast

Source: MAFF, HGCA.

The crushing process extracts an average of 40 per cent oil, leaving a residual of 60 per cent meal for the livestock feed market from each tonne. Therefore, in 1998/99 about 966,000 tonnes of rapemeal should be available from the crushers.

2.2.2 EU Subsidies

UK farmers grow a large area of oilseed rape mainly because of EU subsidies rather than real market demand. The area grown increased considerably in the 1978-88 period as the result of the production aid regime.

To control production Maximum Guaranteed Quantities were introduced in 1988 and support reduced. More fundamental reform of the oilseed regime in 1992 limited oilseed production yet further. The basis of these reforms was the lowering of farmgate prices to reflect real market demand, with the farmer compensated through area aid payments. Because oilseed rape yields less than cereals, to

maintain the attractiveness of growing this crop (and stop overproduction of wheat), the aid payments were set higher for oilseed rape than cereals.

A further measure to control EU oilseed production was introduced, under pressure from the US, under the auspices of the Blair House Agreement. If the area of EU oilseeds exceeds the maximum guaranteed area, aid payments are reduced by 1 per cent for every 1 per cent the base area is exceeded. Also, aid payments are inversely linked to world oilseed prices. So, if the weighted world price is above or below the EU reference price by more than 8 per cent in the period July to January, aid payments are adjusted. These measures will have a dramatic impact on UK farmers in the coming year as aid payments will be scaled back by 34 per cent because of overplanting of oilseed across Europe.

Oilseed rape can be grown on set-aside land if used for industrial (non-food) production. For example, high erucic varieties of oilseed are grown for use in the plastics industry. In 1994, 87,000 hectares of oilseed rape were grown on set-aside, but this has fallen to just 28,000 over the past two years because of the low set-aside requirement of 5 per cent.

Reform of the oilseeds regime is a key aim of the European Commission. In a move designed to improve the negotiating position of the EU in the upcoming World Trade Organisation talks, the Commission proposes to set the area aid payment at the same level for both cereals and oilseeds. Such harmonisation is predicted to reduce the profitability of oilseed rape by 20 to 30 per cent, even though international oilseeds prices are expected to rise during the next five years (Agra Europe, 1999). Consequently, farmers may quite rationally choose to grow more cereals and less oilseed rape.

Rotational constraints, however, may act to limit the fall on oilseed rape area. On most specialist arable farms rotations are already tightly geared to maximising areas of first wheats (the most profitable combinable crop). Farmers may therefore have relatively little opportunity to tighten their rotations further because of the effect on overall crop health / yields. Farmers may also continue growing significant areas of oilseed in the expectation that lower supplies of rapeseed would increase the price received from the crushers.

The outlook for set-aside and consequently the growing of oilseed for industrial use, remains unclear. Whilst the Commission intends to retain compulsory set-aside at a basic rate of zero, the conditions covering voluntary set-aside are more uncertain. It will be retained subject to improvements, particularly regarding environmental considerations. The implications for 'non-food use' oilseed grown on (voluntary) set-aside were not alluded to. Some countries, like France, have developed significant industries on the back of 'non-food use' oilseed grown on set-aside, and were arguing strongly that the Agenda 2000 reforms introduce a separate aid package to ensure the viability of these industries. Though no such package is apparent, it seems likely that the text affecting set-aside will be suitably phrased to allow the continued use of voluntary set-aside for 'non-food use'.

The policy changes outlined above are still subject to possible changes. EU finance ministers may call for further reform. Current expectation suggests that they will not wish to reopen negotiations, especially in view of the resignation of the Commissioners. But many pundits suggest that the finance ministers may well 'bolt on' to the already agreed reforms a policy mechanism (degressivity) which will gradually reduce area payments over time.

In the UK most rapemeal is incorporated into concentrated livestock feeds or exported.

Table 2.9 The Use of Oilseeds, Soya, Sunflower and Other Oilseeds in the Production of Feedingstuffs in Great Britain 1992-98

	Thousand Tonnes						
	1992	1993	1994	1995	1996	1997	1998*
Cattle and Calf Feed	3,861	3,994	4,061	4,172	4,112	3617	3469
Pig Feed	2,249	2,318	2,326	2,243	2,337	2482	2600
Poultry Feed	3,374	3,357	3,421	3,531	3,567	3632	3640
Sheep Feed	540	510	591	635	704	618	588
Horse Feed	146	139	151	162	168	161	165
Other Compounds	203	225	237	269	319	334	358
Other Processed Straights	218	206	216	209	208	232	214
Total All Feedingstuffs	10,591	10,749	11,002	11,221	11,414	11076	11035
of which:							
Oilseed rape cake and meal	716	647	689	683	603	580	558
Soya cake and meal	957	981	1,027	1,127	1,184	1177	1207
Sunflower cake and meal	360	340	382	539	523	540	446
Other oilseed cake and meal	312	372	429	482	555	443	448
Meat and bone meal	181	182	181	183	42	1	2
Fishmeal	168	178	181	182	202	220	213

* Estimated.

Above table excludes the use of ingredients in integrated poultry units.

Source: MAFF

Rapemeal is most widely used in cattle rations, particularly for dairy cows with inclusion rates of 10-16 per cent. Whilst rapemeals have a good energy value, it is their use as a protein provider which is most important. Low palatability, however, prevents higher inclusion rates. Furthermore, use in pig and poultry rations is further limited to levels lower than 8 per cent because of high glucosinolates in the rapemeal containing high erucic acid levels. By implication, varieties of oilseed grown for uses requiring high erucic acid levels are of even more limited use for livestock feeding and consequently trade at a discount.

Rapemeal's main competitor as a protein ingredient in livestock feeds is soyabean meal. Soya, like rapemeal, is a co-product of the crushing process. As the dominant oil producing crop in the world, soyabean meal is the barometer crop. So usage of rapemeal in feed rations is heavily influenced by the price of soyabean meal. Moreover, soya is a better quality protein. This means that rapemeal trades at a large discount to soya to be attractive to feed compounders and farmers who homemix rations.

The increasing dominance of soya in the feed compounding market is clearly shown in Table 2.9. In 1992, 716,000 tonnes of rapemeal was used compared to 957,000 tonnes of soya. But for 1998, the corresponding figures are estimated at 558,000 tonnes of rapemeal and 1,207,000 tonnes of soya.

The declining popularity of rapemeal in livestock rations is only partly explained by the falling soya price. As reflected in Figure 2.1, the ratio of the soya to rapemeal price has remained fairly constant. The sharp fall in the profitability of dairy and beef farming combined with a rapidly expanding pig sector (prior to 1998) are probably the key reasons for the relative decline of rapemeal usage. The exclusion of meat and bone meal from rations in 1996 would have also benefited soya rather than rapemeal because of its protein quality.

Immediate prospects for rapemeal usage in feeds remain weak. Whilst the collapse of the pig sector may well have improved the relative position of rapemeal, it will not have improved the overall demand for rapemeal. Exports of rapemeal for use by foreign compounders will also be difficult given the strength of the pound. And though farmers are expecting an improvement in the price of beef and milk, especially if the pound weakens, few forecast a large improvement. What's more, with a bumper crop of soya expected from South America at very low prices thanks to currency problems in Brazil, rapemeal will have to be very cheap to compete.

Longer term, two factors could improve the demand for rapemeal. Firstly, reform of livestock support regimes may not actually reduce ruminant livestock production. Milk production is almost certain to expand given the allocation of extra milk quota. Moreover, it is difficult to foresee any marked reduction in beef production across the EU given the relatively generous increases in compensation payments proposed.

Secondly, consumer concern with Genetically Modified products in Europe could affect the feeding of livestock. Whilst the world may currently be awash with soya, a significant amount of this crop is grown in the US from GM seed. One major UK supermarket is already reviewing the production methods of its products. Should they (followed by other supermarkets) insist that no GM feeds be used in the production of the meat they sell, the price of European rapemeal could increase because no commercial oilseed rape crops in Europe are grown from GM seed. By implication, should GM seed become available for growing oilseed, the price of the rapemeal produced from such crops may be heavily discounted to reflect its unavailability for livestock feed.

2.2.4 Demand for Vegetable Oil

Finally, the world demand for vegetable oil also influences the rapemeal price. The stronger the demand for rape oil, the more oilseed crushed and consequently the more rapemeal produced. Prices are quoted for the oils of palm, soybean, rape and sunflower, with soybean oil again acting as the barometer. Until recently prices have been relatively firm because of strong demand. Reduced availability of palm oil in Asia has also improved the price of other oils. But export demand has since worsened triggered by the economic problems in Brazil.

The longer term prospects for oil are generally optimistic. Demand from Asia should improve as the economies of the region develop. China, in particular, offers massive potential. But in the medium term, given the continued boom in the production of oilseed crops - especially soya - oil supply rather than demand is likely to drive oil prices. As with any crop, however, weather can quickly confound production forecasts.

2.3 Cost of Processing, Haulage and Marketing

The cost of processing, haulage and marketing depends on which of the markets identified above are targeted. If sold in bulk as a basic organic fertiliser, production and marketing costs are likely to be relatively small per tonne. But if rapemeal is included within a specialised lawn care product, the costs will be much higher.

Some companies are already including rapemeal in their product range. W.L.Dingley and Company based in Evesham, Worcestershire list rapemeal as an ingredient in their organic compound fertilisers. Other companies, like Angus Fertilisers Limited of Montrose, have previously shown interest in the potential of rapemeal, but are yet to commit resources to assessing this potential (Ballantyne, pers com, 1999).

Close proximity to one of the major crushers is important because of the high cost of transporting such a bulky product. As important, may be the demand from crushers that large tonnages be taken

by the fertiliser processors. The five major crushers process around 1000 tonnes of oilseed a day, yielding about 600 tonnes of rapemeal. Clearing this product quickly away from their premises is an important requirement for them. Feed compounders can meet this demand. Whether fertiliser processors can obviously depends on the market need. This volume requirement may be a significant barrier to the largescale production of rapemeal fertiliser.

Establishing a precise processing and marketing cost per tonne for rapemeal fertiliser is very difficult. But given that fertilisers into the sportsfield are currently priced around £400 per tonne, and that the cost of rapemeal has ranged from £54 to £138 per tonne on the last few years, the margin would appear attractive for processors.

2.4 Conclusions

Rapemeal could well have a viable use as a fertiliser. There is:

- a ready supply of rapemeal available at prices ranging from £54 to £138 per tonne, with even lower prices for a limited amount of high erucic rapemeal;
- the opportunity to market rapemeal as a organic fertiliser;
- a comparatively large market for organic, slow release fertilisers in the sports field / golf course market at the £400 per tonne level;
- a more specialised market in very high value lawn care fertilisers which is forecast to grow; and,
- a possible, though more sensitive, market in the organic farming sector as a compound fertiliser worth around £200 per tonne.

However, against the above potential the following factors should be stressed:

- the fertiliser market is extremely competitive and establishing new products may require considerable commitment on the part of processors;
- the requirements and cost of processing rapemeal into a product suitable for the above markets are difficult to establish without further research;
- the possible, though likely limited, reduction in area of oilseed rape grown by UK farmers if the Common Agricultural Policy is reformed in line with current expectations; and
- the potentially massive impact on world oilseeds production if the trade in GM soya crops is interrupted.