

FRASER RIVER ACTION PLAN



Marketing Plan
for
Pelleted and Crumbled
Composted
Poultry Manure
Product



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MARKETING PLAN
FOR
PELLETED AND CRUMBLED
COMPOSTED POULTRY MANURE
PRODUCT

JUNE, 1995

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Disclaimer: This report contains information that was collected under contract to the Department of Environment, Pacific and Yukon Region. The report represents the opinion of the authors alone and should not be considered to reflect the policy or position of Environment Canada.

ACKNOWLEDGEMENT

This study has been funded by the Fraser River Action Plan administered by Environment Canada. The authors would like to thank the steering committee, consisting of federal and provincial government officials and private industry, for guiding this research effort. The members of the steering committee are:

Mr. Horst Romani, Aircomp Engineering
Mr. Fayyaz Elahi, Aircomp Engineering
Mr. Stan Loewen, Coast Agri
Mr. Stewart Paulson, British Columbia Ministry of Agriculture, Fisheries and Food
Dr. John Paul, Agriculture and Agri-Food Canada
Mr. Roger McNeill, Environment Canada

EXECUTIVE SUMMARY

1.0 INTRODUCTION

In 1994, the Canada-British Columbia Green Plan for agriculture commissioned a study¹ to assess the market potential for poultry waste generated in the lower Fraser Valley of B.C. The impetus for that study originated from environmental concerns over the quantities of poultry waste being produced and disposed of in relation to the local carrying capacity of the land.

One of the end use markets identified in the Ference-Weicker and Co. report was a value added fertilizer market for a pelleted composted poultry manure product. The current study, in the form of a detailed marketing plan, looks at this market with the objective of stimulating potential investors and entrepreneurs to develop a poultry manure pelleting and composting industry in the lower mainland of B.C. Development of this industry, in turn, will provide an alternative use of poultry wastes and alleviate some of environmental concerns associated with current manure disposal methods.

2.0 REPORT OUTLINE

This report consists of three sections.

Section 1 is the Marketing Plan.

Section 2 is presented as Appendix I in this document. It is a market research report detailing our investigative findings of the products, sources of supply, and volume of demand for slow release fertilizer products. The findings served as the basis for developing the marketing plan for pelleted and crumbled, composted poultry manure. Appendix I contains the following:

- a discussion of slow release product definitions and nomenclature
- a description of slow release fertilizer products and producers in the market place
- an evaluation of product characteristics in relation market segments
- prices of competing organic fertilizer products
- estimates of the potential B.C. market for pelleted and crumbled, poultry manure
- list of contacts

Section 3 of this report is Appendix II. Appendix II contains retail price estimates of different

¹ Ference-Weicker and Co. Options to Remove Poultry Manure from the Fraser Valley, 1994.

hypothetical fertilizer blends containing pelleted and crumbled, composted poultry manure product. Three products are designed, which correspond to the nutrient analyses of popular products in the home and garden retail market segment.

3.0 STATEMENT OF OPPORTUNITY

An opportunity exists to pellet and crumble properly composted poultry manure and sell the resulting product as an organic fertilizer.

The review which has gone into the development of this plan has uncovered much information on the growth of the organic fertilizer market, the competition that exists both in Canada and the USA and the expectations that distributors and retailers have for organic fertilizer products. Having gone through this process it is our belief that the statement of opportunity is correct although the level of local opportunity (BC tonnage) and selling price appear to be lower than were originally anticipated. With proper development of the product, sufficient research to prove up the product and an aggressive marketing campaign to secure markets beyond British Columbia the volumes needed to utilize the planned 24,000 ton plant should be marketable at the planned \$100 to \$150 selling price.

4.0 FACTORS TO CONSIDER

There are a number of identifiable factors which need to be considered in developing a marketing plan for PCCPM. These are outlined in the body of the marketing plan and set the tone for the directions that the plan must take.

5.0 MEASURABLE OBJECTIVES

The objectives cover the requirements to:

- obtain raw material for the process
- produce properly made composts
- process the composts into top quality finished products
- conduct research to prove up the products
- carry out the marketing plan to develop markets with all industry segments
- create reasonable profit for the operation

6.0 MARKET SEGMENTATION

There are a number of identifiable markets for PCCPM within the BC region. This plan looks at:

1. Fertilizer blenders
2. Commercial organic producers
3. Retail home garden centres & fertilizer distributors
4. Vegetable market gardeners
5. Landscapers and lawn care firms
6. Golf course superintendents
7. Recreation facility and parks managers
8. Conventional farmers
9. Service clubs - as fund raising initiative

Each of these market segments have particular characteristics and key persons, groups or information that influence them in their buying decisions. Examples are fertilizer blenders who:

- are knowledgeable about the market
- are profit oriented
- are concerned about image
- are competitive
- want products which will allow formulation for established markets
- want "zero" problems relating to burn

In turn they are influenced by:

- customers
- other fertilizer trade members
- researchers
- their profit and loss statement

Each of these market segments are reviewed to determine these characteristics for use in developing individual marketing strategies.

7.0 ENVIRONMENTAL ASSESSMENT

The environmental assessment reviews the trends within the social structure and the economy which will have an effect on the development and profitability of the product and markets. An example was put forth by one of the proponents when questioned as to why a plant such as this would not be built in California rather than British Columbia. His answer was that in California

a plant such as this would be considered a polluting industry. In British Columbia it is considered a solution to the problem.

The assessment covers socio-demographic trends, economic trends, government trends, technological trends, resource availability and competition. The conclusions reached are that continuing trends to more recycling, less pollution, increased economic pressures, governments more attuned to environmental issues and public perception that "natural" is somehow better will lead to increasing markets for organic fertilizers and composts for all types of growing situations. These markets will, however, pay little extra for the aesthetic aspects of the products, keying instead on the economic benefits that can be demonstrated and the amount of money that they have available. This will mean that the markets will grow slowly as the economic benefits of the products tend to take longer to elicit the emotional reactions to change the buying habits.

As well the assessment has pointed out that there are a number of very fine competitors for this product with more coming on stream. The competitive analysis shows some particular opportunities in British Columbia in the filler and organic base market as there appears to be a mid-price range which is currently not being filled in this province. This may not be the case however when the product moves into markets in the USA which tend to have a larger number of organic products at their disposal.

8.0 POSITIONING

The positioning of the product looks first at what the customers say they would like to see in a product and then compares those properties to what the proponents for the project would like to see. Often these can be divergent but if the product is to be successful it must address the customer desires. Examples of customer and processor perceptions are:

For the customer:

- a product with consistent sizing within a fairly narrow range
- a product free from odour.
- a product which has research behind it
- a product which provides value for the money
- a consistent product
- a product which is readily available
- for the filler market, a product which is cheap, easily blended, stays blended (does not separate readily), has particle integrity and provides recognizable benefits to the end fertilizer activity
- the fact that the raw material for the product is compost provides some additional value due to the antigen factor.

- for fund raisers, a low priced product with significant mark-up, no problems in either the product use or distribution, that has good promotional materials and has foolproof, easy to learn customer order taking systems

For the proponent:

- a product which has superior growing capabilities
- a product which has recognizable value even though the price may be higher than for chemical fertilizers
- a market which accepts large size pellets
- odour (and burning) either seen as a non-issue or eliminated by some other method than full composting
- the fertilizer viewed as a superior local product providing a positive environmental recycling service

This leads to the development of a unique marketing position which must be based on extensive research in order to validate the view of PCCPM as a value priced product with superior growth attributes. This leads to the identification of the PCCPM selling points as:

- organic, therefore time release
- compost based
- sized for differing applications
- local, environmental recycling service
- a pleasant organic aroma or odour free
- consistent
- relatively high NPK values as compared to some alternatives
- cheaper than comparable import products
- widely distributed

9.0 MARKETING PLAN STRATEGY

There are many marketing strategies which must be developed as each market or type of market requires a slightly different approach in order to be successful. The plan addresses a total of nine market segments although four are deemed to be inconsequential and no strategies are presented at this time.

The markets for which strategies are recommended are:

1. Fertilizer blenders
2. Retail home garden centres & fertilizer distributors

3. Vegetable market gardeners
4. Golf course superintendents
5. Recreation facility and parks managers.

There are overlaps within these markets. The fertilizer blender market is a manufacturing or distribution market as compared to the balance which are either retail or end user markets. The blenders, as primary first receivers of PCCPM, are anticipated to account for 85% of the initial market for the product or better. The product will go into blends with chemical fertilizers or be sold through blender distribution systems as homogeneous bagged or bulk product in all the other markets indicated above. Only a small remaining fraction of the production is expected to be marketed directly to retailers or end users by the manufacturer of PCCPM. The manufacturer must, however, promote the product to retail markets and end users whether it be in blends or as a homogeneous product in order to generate market "pull-through" for the product.

Executive Summary Table 1 indicates the estimated volumes associated with the marketing channels for PCCPM at the outset. The lower portion of the Table also presents anticipated sales of PCCPM product and current markets for processed natural organic (PNO) products by market segment and representing all marketing channels.

10.0 MARKETING PROGRAM TIMING

The marketing program reflects the five stages that all products go through over their life span. These stages are:

- development
- introduction
- growth
- maturity
- decline

This product has a significant amount of work which must be done prior to general marketing release to conduct the research on both the growth and physical attributes of the product. It is not like marketing a pet rock where the reaction and therefore buying decision is purely emotional.

A fertilizer or organic filler product has the potential to create significant growth in various crops. It also has the potential to create significant problems. The avoidance of those problems is paramount, even greater than the potential gains that are possible using the product. The gains can be accomplished using many different and available products and management programs. The problems are yours alone and must be avoided.

Executive Summary Table 1

Estimated Markets for Pelleted & Crumbled, Composted Poultry Manure (PCCPM) and Processed Natural Organics (PNOs) by Sales Channel, Market Segment and Price Sensitivity, B.C., 1995.

Market Breakout by Sales Channel	PCCPM At \$150/Tonne Ex-Plant		PCCPM At \$100/Tonne Ex-Plan			
	Tonnes					
a) Fertilizer Blenders to:						
Retail Home Garden Centres and Fertilizer Distributors	900	1500				
Vegetable Market Gardeners	90	150				
Golf Course Superintendents	113	188				
Recreation /Parks/Cemetary Managers	337	562				
Landscapers and Horticultural	0	0				
Total Fertilizer Blender	1440 (85 %)	2400 (85 %)				
b) Direct to Retail/End User						
Retail Home Garden Centres and Fertilizer Distributors	159	265				
Vegetable Market Gardeners	16	26				
Golf Course Superintendents	20	33				
Recreation/Parks/School Yard and Cemetary Managers	59	99				
Landscapers and Horticultural	0	0				
Total Direct Retail/End User	254 (15%)	423 (15%)				
Total Estimated PCCPM Market	1694 (100%)	2823 (100%)				
Breakout of Total Estimated Market By Market Segment	PCCPM At \$150/Tonne Ex-Plant	Current PNO Use	Total Estimated Market	PCCPM At \$100/Tonne Ex-Plant	Current PNO Use	Total Estimated Market
Retail Home Garden Centres and Fertilizer Distributors	1059	545	1604	1765	545	2310
Vegetable Market Gardeners	106	55	161	176	55	231
Golf Course Superintendents	132	150	282	221	150	371
Recreation/Parks/School Yard and Cemetary Managers	396	350	746	661	350	1011
Landscapers and Horticultural	0	15	15	0	30	30
Total Estimated PNO Market	1694	1115	2809	2823	1130	3953

The timing for the marketing program for this product must therefore require slow and cautious development and introduction phases with ongoing product and process testing because one major problem could be one problem too many. Properly developed and introduced we believe that the growth stage can go on for the foreseeable future as we believe the market for organic products will continue to grow. Those products which have poured the foundation will be able to build into new regions and expanding markets on that foundation. Those without the foundation may not be able to take advantage of the growth which is foreseen.

11.0 MARKETING PLAN CONCLUSIONS

Although a marketing plan does not in reality have a conclusion, unless it occurs in the decline phase of a product's life cycle, it is appropriate to outline the conclusions which the development of this marketing plan inevitably leads us to. These are:

- there is a market for organic fertilizers produced from poultry waste
- proper composting of the poultry waste creates a product which has more value than the poultry waste itself especially as further research proves up and allows the identification of antigen factors in promotional materials
- pelleted and crumbled compost has more perceived value than unprocessed compost as the product appears more homogenous and sizing for different applications is possible
- fertilizer values are important for all markets although a low value product can still be marketed for filler or soil amendment
- odour is an issue - pleasant is OK, less is better, none is best
- if identified as an organic product, burning is not acceptable
- physical properties of the product are important but can be managed
- the size of current organic fertilizer markets is small and the local market will not support the size of plant intended, requiring expansion into other markets in Canada and the western USA
- competition will continue to build as new forms of recycled products are returned to the earth as fertilizer
- superior value when measured against both chemical and organic fertilizers, the level of research backing the product and truly spectacular service will result in business success

TABLE OF CONTENTS**EXECUTIVE SUMMARY****TABLE OF CONTENTS**

1.0	STATEMENT OF OPPORTUNITY	1
2.0	FACTORS TO CONSIDER	4
2.1	PRODUCT	4
2.2	MARKETS	5
3.0	MEASURABLE OBJECTIVES	5
4.0	MARKET SEGMENTATION	6
4.1	CUSTOMERS LIST	6
4.2	TARGET CUSTOMERS	6
4.2.1	Fertilizer Blenders	6
4.2.2	Commercial Organic Producers	7
4.2.3	Home Garden Centres and Fertilizer Distributors	7
4.2.4	Vegetable Market Gardeners	8
4.2.5	Landscapers and Lawn Care Firms	8
4.2.6	Golf Course Superintendents	9
4.2.7	Recreation Facility/Parks/School Yard and Cemetery Managers	9
4.2.8	Farmers	10
4.2.9	Service Clubs	10
5.0	ENVIRONMENTAL ASSESSMENT	11
5.1	SOCIO-DEMOGRAPHIC TRENDS	11
5.2	ECONOMIC TRENDS	11
5.3	GOVERNMENT TRENDS	11
5.4	TECHNOLOGICAL TRENDS	11
5.5	RESOURCE AVAILABILITY	12
5.6	COMPETITION	12
5.6.1	Filler and Organic Base Market	13
5.6.2	Soil Amendment Market	14
5.6.3	Organic Fertilizer Market	15
5.6.4	Controlled Release Fertilizer Market	16

6.0	POSITIONING	17
6.1	PERCEPTION OF PRODUCT	17
6.2	UNIQUE MARKETING POSITION	18
6.3	SELLING POINTS	18
7.0	MARKETING STRATEGY	20
7.1	FERTILIZER BLENDERS	21
7.1.1	Specific Message	22
7.1.2	Information Channels	22
7.1.3	Motivation For Purchase	23
7.1.4	Coordination Of Distribution	23
7.1.5	Follow Up	23
7.2	COMMERCIAL ORGANIC PRODUCERS	23
7.3	HOME/GARDEN CENTRE RETAIL & FERTILIZER DISTRIBUTORS	24
7.3.1	Specific Message	24
7.3.2	Information Channels	25
7.3.3	Motivation For Purchase	25
7.3.4	Coordination For Distribution	25
7.3.5	Follow Up	26
7.4	VEGETABLE MARKET GARDENERS	26
7.4.1	Specific Message	26
7.4.2	Information Channels	27
7.4.3	Motivation For Purchase	27
7.4.5	Follow Up	27
7.5	LANDSCAPERS AND LAWN CARE FIRMS	27
7.6	GOLF COURSE SUPERINTENDENTS	28
7.6.1	Specific Message	28
7.6.2	Information Channels	28
7.6.3	Motivation For Purchase	29
7.6.4	Coordination Of Distribution	29
7.6.5	Follow Up	29
7.7	RECREATION FACILITY/PARKS/SCHOOL YARD & CEMETARY MANAGERS	29
7.7.1	Specific Message	30
7.7.2	Information Channels	30
7.7.3	Motivation For Purchase	30
7.7.4	Coordination of Distribution	30
7.7.5	Follow Up	31
7.8	CONVENTIONAL FARMERS	31
7.9	SERVICE CLUBS	31

8.0	MARKETING PROGRAM TIMING	32
8.1	DEVELOPMENT STAGE	32
8.2	INTRODUCTION STAGE	32
8.3	GROWTH STAGE	33
8.4	MATURITY STAGE	34
8.5	DECLINE STAGE	34
9.0	EVALUATION	35

APPENDIX I:	Market Research Report	<i>I-1</i>
APPENDIX II:	Estimated Retail Prices for Fertilizer Blends Containing Pelleted and Crumbled, Composted Poultry Manure in the Home and Garden Filler Market	<i>II-1</i>
APPENDIX III:	List of Contacts	<i>III-1</i>

A PLAN TO MARKET PELLETED AND CRUMBLED, COMPOSTED POULTRY MANURE

In 1994, the Canada-British Columbia Green Plan for agriculture commissioned a study¹ to assess the market potential for poultry waste generated in the lower Fraser Valley of B.C. The impetus for that study originated from environmental concerns over the quantities of poultry waste being produced and disposed of in relation to the local carrying capacity of the land.

One of the end use markets identified in the Ference-Weicker and Co. report was a value added fertilizer market for a pelleted composted poultry manure product. The current study, in the form of a detailed marketing plan, looks at this market with the objective of stimulating potential investors and entrepreneurs to develop a poultry manure pelleting and composting industry in the lower mainland of B.C. Development of this industry, in turn, will provide an alternative use of poultry wastes and alleviate some of environmental concerns associated with current manure disposal methods.

A significant market channel for pelleted and crumbled, composted poultry manure (PCCPM) has been investigated in this study. The "filler" market for conventional blended and mixed fertilizers, currently held by limestone, is accessible to processed natural organic (PNO) products based upon inherent advantages related to slow nutrient release, soil-amending properties, micro-nutrient content, and perceived antigen characteristics. The entry of PNO products into the professional turf and retail markets can not be explained solely in terms of nutrient content, although nutrient level in PNO products can be a quality factor. Rather, transformation and improvement of the physical characteristics of poultry manure and composts by further-processing increases their potential range of application and substitutability for a wider range of products.

1.0 STATEMENT OF OPPORTUNITY

An opportunity exists to pellet and crumble properly composted poultry manure and sell the resulting product as an organic fertilizer. Essentially, the opportunity identified is related to the potential use of PCCPM as a filler material in organically-based chemically formulated blends sold into horticultural, institutional and home and garden retail markets. In comparison, the organic soil conditioner/fertilizer market does not attach significant additional value to PCCPM products in relation to standard composted products, nor pay the premium associated with their extra cost of manufacture.

¹ Ference-Weicker and Co. Options to Remove Poultry Manure from the Fraser Valley, 1994.

The estimated current size of this opportunity and the market segments in which they are located is indicated in Summary Table 1. The total size of the filler market in those market segments PCCPM is anticipated to penetrate is estimated in the range of 7,140 to 8,370 tonnes, annually (average 7755 tonnes). Of this total, the market share which PCCPM may gain is mainly a function of price. Based on price, total potential penetration into the filler market by PCCPM at an ex-plant cost of \$100 to \$150 per tonne is estimated at 50% and 30%, respectively. This represents a potential market for PCCPM at the indicated prices in the range of 1440 to 2400 tonnes, annually.

The direct to home/garden retail and end-user market is anticipated to account for 15% of the total estimated market for PCCPM, in the range of 254 to 423 tonnes, annually. While this market may not contribute appreciably to the profit margin of the PCCPM manufacturer, there is a strong need to provide exposure and develop a reputation for the product among the widest population of end users of PNO products.

The current penetration of PNO materials in the B.C. fertilizer market place is about 1,115 to 1,130 tonnes, annually, all produced out of province. The extent to which PCCPM may penetrate existing markets for PNO products has not been explored in this study. Nevertheless, commercial production of PCCPM products with equivalent or superior characteristics to current PNO products at competitive prices may be expected to provide the opportunity to acquire significant market share in this area.

Price is a critical component of the market opportunity for PCCPM. A price range of \$50 to \$400 per tonne was examined in the course of the market research. It became apparent that, although competing organic products are sold in BC at the higher levels, the market volumes involved do not justify the construction of a pelleting plant (see Appendix I, Table 13, p. 36). Moreover, the number of years to attain market potential is indicated to increase in direct relation to the price of the product.

The primary market segment for PCCPM is considered to be the bulk filler market to fertilizer blenders, representing a wholesale price ex-plant in the range of \$100 to \$150 per tonne, depending on the end market the product would be going into. Entry into the market is based on capturing a significant portion of the filler market presently filled by limestone at \$50 per tonne.

Appendix II presents estimates of retail prices for hypothetical fertilizer blends using PCCPM as an ingredient. Clearly, adding PCCPM to boost fertilizer analysis is not a cost effective means of supplying nutrients to crops in comparison with higher analysis chemical sources. However, as a filler in fertilizer blends, PCCPM is competitive with limestone which contains no nutrients, on in the range of \$100 per tonne the basis of nutrient value only.

Some of the other beneficial aspects in the product would need to be marketable for the product

Summary Table 1

Estimated Market for Pelleted & Crumbled, Composted Poultry Manure (PCCPM) and Current Market for Processed Natural Organic (PNO) Products By Market Segment, B.C., 1995.

Market Segment	Fertilizer Tonnage	Potential Filler Market Accessible to PCCPM (1)	Estimated Blender Market for PCCPM as Fillers (2)(4)	Estimated Retail Market for PCCPM (3)(4)	Current PNO Market (5)	Estimated Total PNO and PCCPM Market (4)
Tonnes						
Total Conventional Farm	?	?	neg. (6)	neg.	neg.	neg.
Fraser Valley & V.I.						
Field Veg & Berries	5860	1760	neg.	neg.	neg.	neg.
Field Crops	?	?	neg.	neg.	neg.	neg.
Tree Fruits	?	?	neg.	neg.	neg.	neg.
Organic Farm	neg.	neg.	neg.	neg.	neg.	neg.
Total Horticultural	3,870-4,200	1,120-1,270	neg.	neg.	15-30	15-30
Landscapers	500-1,000	150-300			15-30	
Field Nursery	570	170			0	
Container Nurseries	2,700	800			0	
Ornamentals/Greenhouses	100	0			0	
Total Institutional	4,200-5,800	1,260-1,740	450-750	79-132	500	1,029-1,382
Golf Courses	1,000-1,500	300-450	113-188	20-33		
Recreation/Parks/Schools	700-1,000	210-300	76-127	13-22		
Cemeteries	2,500-3,300	750-990	261-435	46-77		
BC Home/Garden Retail	9,000-11,000	2,700-3,300	900-1,500	159-265	540	1,604-2310
Vegetable Market Gardener	900-1,100	270-330	90-150	16-26	60	161-231
Mine and Landfill Reclamation	neg.	neg.	neg.	neg.	neg.	neg.
Totals		7,140-8,370	1440-2400	254-423	1,115-1,130	2,809-3,953

Notes: (1) On average, fillers comprise 30% of fertilizer tonnage.

(2) The filler market to blenders is estimated at 85% of the total potential market for PCCPM.

(3) The direct to home/garden retail and end user markets is estimated at 15% of the total potential market for PCCPM. This percentage has been applied in all market segments.

(4) Potential market for PCCPM is generated as follows:

i) Averages of the ranges for the filler market segments are calculated from column 3.

ii) Ranges for PCCPM filler and direct home garden retail and end user markets are obtained by multiplying the averages (in column 3) by 0.5 or 0.3, representing the shares of PCCPM in the filler market at ex-plant costs of \$100 and \$150 per tonne, respectively.

iii) Estimated direct to home/garden retail and end user markets for PCCPM (column 5) are added to the PCCPM range estimates of penetration into the filler market (ii) above)

iv) Current PNO use (column 6) is added to the PCCPM range estimates in each market segment to generate estimated total PNO and PCCPM market (column 7).

(5) PNO = Processed Natural Organic materials (see Appendix 1 for details).

(6) Neg. = Negligible

to realize the \$150 per tonne upper end of the estimated price range for PCCPM, and beyond. For example, the organic, soil conditioning, micro-nutrient, and "antigen" qualities of PCCPM may become more desirable to end users in the future. As well, supportive scientific research and field testing would promote demand for the product. At pricing below existing products and with thorough supporting research, PCCPM could capture a significant portion of the market for "high value" organic fertilizers.

2.0 FACTORS TO CONSIDER

2.1 PRODUCT

1. Poultry waste contains significant nutrients for plant growth.
2. Proper composting of poultry waste reduces free ammonia and provides a slow release largely odour free fertilizer product suitable for many applications.
3. Pelleting and crumbling of composted poultry waste provides fertilizer products with uniform sizes suitable for application.
4. Raw poultry waste spread on land in the Abbotsford area appears to be leaching nitrogen into the aquifer serving that region and efforts are being made to reduce the amount so spread.
5. The form in which the poultry waste is spread (composted, raw, pelleted) affects the amount of leaching.
6. If not solved through other methods there are indications that government may use regulation to reduce the amount of manures spread on land in the region. (It should be noted that N from chemical fertilizer sources is probably more significant than N from manure).
7. The proponents of the project wish to produce a pelleted, crumbled product made from poultry manure (layer) composted for a two to four week period. This would normally leave a quite distinguishable odour but we are assured by the proponents that this is not the case with the methods being used.
8. Poultry manure composted for eight months produces an odourless product with a similar nitrogen level to the raw manure (albeit at much less volume).

9. With its compost base the end product contains valuable micronutrients.
10. The size and shape of the granule is a major determinant in the uses that the product can be put to.

2.2 MARKETS

11. There are a range of organic products available in the market today. These range from bagged raw manures to fully formulated organic prilled products.
12. There appears to be some growing belief that organic or organic based fertilizer products may have benefits over and above the simple NPK values of the products.
13. Studies are being conducted that suggest that composted organic fertilizers may have antigen properties.

3.0 MEASURABLE OBJECTIVES

- Obtain sufficient quantities of poultry waste with consistent composition to prepare a compost with a predictable nutrient profile.
- Produce composts which are properly made to maximize the nutrient values, minimize the odour and destroy pathogens in the final product yet maintain a significant base of beneficial bacteria and antigens (the product is not sterile).
- Pellet, dry and crumble the compost to produce a range of products of stable size and composition, suitable for uses in various applications.
- Conduct research on the products produced to provide proof as to their beneficial effects in each of the applications intended.
- Preparation and dissemination of a marketing plan which will cause various categories of fertilizer users (golf course superintendents, parks managers, recreation supervisors, landscapers, gardeners, farmers, etc.) to recognize the value of the product and use it in their applications.
- Sales of sufficient amounts of product at prices which will create a profit for the operation.

4.0 MARKET SEGMENTATION

4.1 CUSTOMERS LIST

1. Fertilizer blenders for use as an organic base or filler with chemical fertilizers
2. Commercial organic producers
3. Retail home garden centres & fertilizer distributors
4. Vegetable market gardeners
5. Landscapers and lawn care firms
6. Golf course superintendents
7. Recreation facility and parks managers
8. Conventional farmers
9. Service clubs - as fund raising initiative

4.2. TARGET CUSTOMERS

4.2.1 Fertilizer Blenders - Major fertilizer distributors

Purchase mainly from primary fertilizer suppliers and service all market segments.

Characteristics

- knowledgeable about market
- profit oriented
- concerned about image
- competitive
- want products which will allow formulation for established markets
- want "zero" problems relating to burn

Key Influencers

- customers
- other fertilizer trade members
- researchers
- profit and loss statement

4.2.2 Commercial Organic Producers

No significant market

Characteristics

- idealistic
- self sufficient
- frugal
- profit important but not overriding
- undercapitalized
- knowledgeable about plant nutrition

Key Influencers

- other producers
- customers
- industry publications
- regulations
- researchers

4.2.3 Home Garden Centres and Fertilizer Distributors

Buy from the blenders

Characteristics

- customers not homogeneous group - includes everyone from avid environmentalists and organic growers to those that want quick greening for their lawns.
- price conscious
- knowledge of fertilizers and soil amendments varies widely so that perception of product value varies widely as well
- centres volume oriented so will retail their private labels at lower prices to create volumes for their own products

Key Influencers

- friends and neighbours

- commercial and institutional gardeners
- garden centre staff
- gardening press - publications and articles

4.2.4 Vegetable Market Gardeners

Buy from blenders and garden centres

Characteristics

- use similar products to home garden market (estimated as 10% of home garden use)
- knowledgeable about results
- cautious about new products
- value conscious

Key Influencers

- other producers
- agricultural researchers and extension agents
- fertilizer reps

4.2.5 Landscapers and Lawn Care Firms

Buy mainly from garden centres although larger firms buy from blenders

Characteristics

- profit oriented
- somewhat knowledgeable of fertilizer and soil amendment use
- price conscious, cheapest bang for the buck that provides immediate results, difficulty recovering additional costs for organic based fertilizers
- time sensitive

Key Influencers

- industry press - articles and publications
- other landscapers
- industry and garden centre staff

- profit and loss statement
- customers (will use what requested - at a price)

4.2.6 Golf Course Superintendents

Buy from the blenders

Characteristics

- very knowledgeable about growing specific types of grass
- interested in new ideas providing backed with research or trials
- value conscious
- large users of fertilizer
- somewhat sensitive to environmental pressures
- main priority is to maintain or improve current quality level of tees, greens and fairways

Key Influencers

- other superintendents
- club members
- industry press - articles and publications
- fertilizer industry reps
- soil and plant researchers

4.2.7 Recreation Facility/Parks/School Yard and Cemetery Managers

Buy from the blenders

Characteristics

- cautious about using new products and methods
- price and budget conscious
- may or may not be particularly knowledgeable

Key Influencers

- other recreation facility managers
- supplier representatives

- financial controllers up line
- industry press - articles and publications

4.2.8 Farmers

Buy from the blenders

Characteristics

- cost conscious
- results and profit oriented
- traditional (conservative about trying new products)
- not homogeneous group, many different positions regarding fertilizer use
- no willingness to experiment with new products so will need substantial research

Key Influencers

- other farmers
- agricultural researchers
- fertilizer reps

4.2.9 Service Clubs

Sold as a fund raiser, bought from firm producing product (often composts or soils) or through sympathetic dealer.

Characteristics

- price sensitive - need relatively low cost product with superior markup
- no product or distribution problems so business is repeatable
- order taking by club with central delivery for distribution
- requires sales and product info. to encourage sale (can be of minimal production values)
- discount structure to encourage volume purchase

Key Influencers

- other fund raisers
- knowledgeable industry personnel with interest in project

5.0 ENVIRONMENTAL ASSESSMENT

5.1 SOCIO-DEMOGRAPHIC TRENDS

The fertilizer markets are very slowly reflecting the environmental activism which has manifested itself in other sectors of the economy. Problems with runoff and ground water contamination by fertilizer nutrients have lead the industry to move toward the use of slow release products. These include coated urea products, polymer or other encapsulated prills and organic fertilizers. This movement has however been much slower than was originally predicted.

5.2 ECONOMIC TRENDS

Although the economic recovery continues to loosen up operating capital in some endeavours such as golf courses, it is still tightening for most of the publicly funded operations such as recreation facilities, parks, school boards, etc. This is also true of the farming community who are traditionally conservative. As well the recession created uncertainty and price consciousness in consumers in general and this will carry over in their purchasing decisions even as their disposable incomes increase.

5.3 GOVERNMENT TRENDS

Governments continue to increase the amount of regulation while at the same time decreasing the financial resources available to operating departments. Much of this is being accomplished through cost recovery on regulatory activities. As environmental concerns continue to come to light regulations to alleviate those concerns are being developed. An example is the problem of nitrogen contamination of the Abbotsford aquifer and the potential for regulations that will reduce the amount of nitrogen releasing compounds allowed to be incorporated into the land above that aquifer. A further example for these trends is the move by the Dutch government to regulate the total amount of phosphates that can be generated per acre. This gives them the authority to reduce the number of birds raised on a piece of land if the combined levels of phosphates from all sources on the land exceeds the allowable limit.

5.4 TECHNOLOGICAL TRENDS

New methods of producing slow or controlled release chemical fertilizers continue to be developed while the numbers of organic or organic based fertilizers in many different forms continue to

expand. Research is pointing to potential benefits of organic fertilizers over and above the values of slow release NPK but the research is immature and not conclusive as far as many agriculturalists are concerned.

5.5 RESOURCE AVAILABILITY

With the continued expansion of poultry as a meat product and similar expansion of the population base in the lower mainland of British Columbia there are increasing amounts of poultry manure to be disposed of. Production methods for broilers differ to some extent from those used in some regions of the USA in that in B.C. barns are cleaned after each cycle whereas manure used for composting in regions contacted in the USA is coming from barns where a number of production cycles are run before cleaning. It appears, however, that B.C. production practices may be moving to repeat use of litter for more than one cycle as litter costs increase.

It should be noted that the CUSTA agreement will reduce the level of protection for the Canadian poultry industry to zero over time and that may have an adverse effect on poultry production. Reviews done to date seem to support the view that there will certainly be sufficient production still in place to support a facility such as envisioned here.

5.6 COMPETITION

The competition for this potential product comes from a number of areas, depending on the production values determined through research, the forms and analysis that the product is sold in, the pricing and quality of the product and the distribution system used. Although the original premise as outlined in the Statement of Opportunity indicates that we are to look at "a pelleted and crumbled composted poultry manure (PCCPM) product", there is the possibility of also selling a composted poultry manure product as a loose compost, in either bags or bulk. In any case the potential customer will review all the options including substitution of loose compost when choosing the product to be purchased for their use.

The competition for this product differs with the types of markets and regions that the product is to be sold into. This review assumes competition in the British Columbia market within the following types of markets:

5.6.1 Filler and Organic Base Market

- PCCPW (pelleted and crumbled, composted poultry manure)
- limestone
- canola meal
- compost
- Sustane

Comparisons

Product	Strengths	Weaknesses
PCCPM	organic product, granular, sized, compost based ("other" antigen factors), 5 % N guarantee, % slow release, price below canola meal and Sustane	price above limestone and compost, odour and burning (if not full term compost), crumble integrity (unknown if physical properties will allow blending and bagging)
limestone	adds weight without bulk, cheap (\$60/ton) consistent	limited nutrient or soil value
canola meal	organic product, adds bulk to soil, has significant nutrient value, non-burning	bulkier than limestone decreasing density, more costly than limestone (\$400/ton)
compost	organic product, adds bulk to soil, has nutrient value, cost above limestone but below canola meal, "other" antigen factors	inconsistent analysis and composition, variable size of product
Sustane	organic product, adds bulk to soil, consistent analysis, significant nutrient value, backed by impressive research, consistent size	expensive (above canola meal), some problems reported with burning on immature plantings,

5.6.2 Soil Amendment Market

- PCCPM
- mushroom compost
- steer manure
- poultry manure
- canola meal

Although included for comparison purposes the high N value and corresponding higher costs of PCCPM and canola meal may eliminate them from active consideration in this market.

Comparisons		
Product	Strengths	Weaknesses
PCCPM	granular, sized, ease of handling, 5% N, slow release, "other" antigen factors	price above all but canola, odour and some potential for burning if not full term compost
mushroom compost	"other" antigen factors, no odour, non-burning	low analysis, availability
steer manure	slower release, cheap	odour, inconsistent product, low analysis
poultry manure	fast N release, cheap	odour, burning if not properly composted, inconsistent
canola meal	slow N release, 6% N, no odour, non-burning, protein based, no salts	price high compared to others

5.6.3 Organic Fertilizer Market

These products are described in more detail in Appendix I. They include:

- PCCPM
- Sustane
- Ringer
- Soil Doctor
- Milorganite

Comparisons

Product	Strengths	Weaknesses
PCCPM	local product, should be able to price lower, compost based ("other" antigen factors)	no research, odour (if not full term compost), size and consistency of granule (possible)
Sustane (granulated composted turkey litter)	good research, consistent product, compost based ("other" antigen factors)	price higher than Soil Doctor, some reports of burning on new plantings, some odour
Ringer (granulated blended organic products)	good research, consistent product, non-burning	highest price of listed products
Soil Doctor (canola meal product)	good research, consistent product, non-burning, lower priced than others (except PCCPM), no odour, Canadian made (\$ fluctuations)	new product (consumers will have to be shown), lower P&K values,
Milorganite (processed human sewage)	long term well known product with acceptable results, non-burning, small consistent size, no odour	low NPK values, sewage based (negative for some), high price when NPK taken into account (even for organic products), real or perceived trace presence of heavy metals

5.6.4 Controlled Release Fertilizer Market

- PCCPM
- sulphur coated urea
- Osmocote and Nutricote
- Once

Comparisons		
Product	Strengths	Weaknesses
PCCPM	price (may not be valid if nutrient value used as criteria), compost product ("other" antigen factors),	nutrient release time undocumented (research), product form not as easily handled, odour and some potential for burning if not full term compost
Sulphur coated urea	cheap price (based on nutrient levels), consistent product, well known by trade and users, time release over uncoated fertilizer	release time quicker than other similar products
Osmocote & Nutricote (polymer coated)	release takes place over much longer period reducing necessity of application, nutrients more available for plants, consistent product	price higher
Once (patented process - controlled release over 8 month period)	release takes place over complete growing season (One application), consistent product	highest price of group

6.0 POSITIONING

6.1 PERCEPTION OF PRODUCT

Comparison of perceptions of the potential product as seen by the prospective customer to the view of the product that the proponents would desire be held. As this is a product which has not yet been produced, (other than the samples provided from the States) there are no customer perceptions except those received from viewing the USA samples and those that potential customers feel are possible for the product.

The customers would like:

- a product with consistent sizing, probably smaller than the crumble sample provided from the USA, with the Soil Doctor size as the upper limit and finer product available for use in highly sensitive areas such as golf course tees and greens.
- a product free from odour. The USA product is felt by many potential customers to have excessive odour for their markets, both from the standpoint of handling the product and also because the odour may indicate sufficient free ammonia to cause burning in young grasses and crops.
- a product which has research, extensive research is preferable, behind it so that they can use or recommend it in a full range of applications and be reasonably certain of the outcomes
- a product which provides value for the money with NPK values which appear to meet the requirements of the crops to which it is applied while possessing slow release capabilities so that the effects are long lasting and fewer applications are necessary
- a consistent product so that they have similar reactions from one batch to the next
- a product which is readily available in close proximity to their operation
- for the filler market, a product which is cheap, easily blended, stays blended (does not separate readily), has particle integrity and provides recognizable benefits to the end fertilizer activity
- for some knowledgeable purchasers the fact that the raw material for the product is compost provides some additional value due to the antigen factor. This, of course, depends to a large extent on how the compost is produced in that if over or under cooked the compost will not provide these benefits.
- for the service or youth group fund raiser market they want to see a relatively low priced product that can be sold with significant mark-up, that has no problems in either the product use or distribution so that they can use a similar fund raiser in succeeding years and have good repeat markets, that has reasonable promotional materials and has order taking systems which are easy to learn for the service or youth group members

The proponents would like to see:

- a product which is viewed as having superior growing capabilities
- the product viewed as having value for the consumer even though the price may be higher than chemical fertilizers
- a change in the market to accept large size pellets as a standard product (in order to improve throughput over the smaller size)
- odour (and burning) either seen as a non-issue or eliminated by some other method than full composting, in order to decrease the time from start to pelleting and therefore vastly reduce the composting area required.
- the fertilizer viewed as a superior local product providing a positive environmental recycling service

6.2 UNIQUE MARKETING POSITION

In order to achieve the perceptions that the company would like to see held within the market place the proponents will need to undertake considerable research to prove out the growing capabilities (and therefore their abilities to compost, pellet and crumble without diminishing the properties inherent in the raw material) and the value of the product in relation to other products on the market. This research could also include usage of a larger pellet.

The research to be done should produce results which are unique to the PCCPM product and can be used in the development of promotion. In the meantime the unique attributes differ when looking at the different market segments therefore different selling points will be emphasized.

When looking at the filler market the unique factors are reflected in the Strengths and Weaknesses. In other words when comparing to limestone the unique factors are the organic component, the additional nutrients that the PCCPM adds to the blend, the "antigen" factor attributable to compost, and the crumble size that approximates the fertilizer granule. When selling against Sustane the unique factors include the local environmental recycling service and a cheaper price (assumed).

6.3 SELLING POINTS

The selling points for PCCPM are:

- organic, therefore time release
- compost based

- sized for differing applications
- local, environmental recycling service
- odour free (assumes changes made to accomplish, remove if not as becomes negative)
- consistent (assumes consistency in inputs and composting)
- relatively high NPK values as compared to some alternatives
- cheaper than comparable import products
- widely distributed (assumes tie in with existing distribution)

7.0 MARKETING STRATEGY

NOTE

As all information on the costs and compositions possible with this product has not yet been received, the following assumptions are made for the purpose of developing the strategies.

1. The compost will be well made to retain antigen properties while destroying weed seeds and pathogens in the substrate.
2. The compost will be finished sufficiently or treated so as to minimize odour.
3. The compost going into the pelleter will be virtually homogeneous throughout the production year.
4. The pelleted and crumbled products will be sized for different uses and will have sufficient internal integrity to have a minimum of fines from any of the sizes.
5. The product can be sold in bulk at \$100 to \$150 per tonne with sufficient profit to create a viable business.
6. The guaranteed NPK analysis for the end product will be 5-4-5 without any supplementation.
7. There will not be sufficient free ammonia to burn even delicate crops (eg. newly seeded lawn)
8. Although the primary focus is to produce products for outside rather than in home use, sized product fines will have the potential for small volume packaging and sale.
9. Although not one of the assumptions put forth by the steering committee, it has been suggested that a lower analysis, possibly 2-4-2, may be produced. This would change the marketing plan considerably as it would diminish the value of the product for all uses, with the exception of use as a soil amendment. The product would still have value as a filler or organic base providing all other factors remained the same, albeit at a lower price level, but those markets utilizing PCCPM for its fertilizer inputs would decrease substantially.
10. The product to be produced will be available in pellet, standard crumble and granulated fines form. The marketing strategies envisioned deal with the product in

crumble or fine forms as these are industry standards at present. There should, however, be research carried out by the company and distributors to determine the acceptability of pellets as an end product. If acceptable to the market for specific uses it may provide a differentiation from the product available from others.

CAUTION

As well as these assumptions there is also one major caution which has arisen in the review leading to the development of this marketing strategy. That is the assumption that the end product should be pelleted and crumbled. It is possible that another method of handling the finished compost might be more profitable without significantly affecting the marketability of the product.

Sustane appears to use a system of hammering and screening following drying to achieve their product. Others simply screen finished compost in order to provide a sized product. Both types of product as well as canola meal are being used for blending to produce organic based fertilizers or are being sold as stand alone organic fertilizers and none require the expense of pelleting and crumbling. Pelleting and crumbling will undoubtedly provide a more evenly sized range of final products. The decision as to whether this step is used should be up to the proponents.

7.1 FERTILIZER BLENDERS

The total fertilizer blender market for fillers potentially accessible to PCCPM in the lower Fraser Valley of B.C. is indicated at some 7755 tonnes, annually (range between 7140 and 8370 tonnes, Summary Table 1, p.3, above). Of this total market, the estimated penetration of PCCPM at \$150 to \$100 per tonne ex-plant is in the range of 1440 to 2400 tonnes, annually. This would represent 30% to 50% of the filler market to fertilizer blenders. As indicated in the Summary Table 1, problems related to particle size, integrity, density and handling characteristics would be the most significant physical factors discouraging use of PCCPM in blends for conventional farm and horticultural applications.

The level of market potential for PCCPM will be expected to vary with the end price of the product to the blender. Initial pricing of PCCPM in the market would essentially be determined by the comparative price of limestone and the value of N-P-K nutrients in the PCCPM product.

It is considered that the target market for PCCPM is largely confined to the blender market at the outset, representing 85% of the potential market for PCCPM. The

destination or end use markets for the blended product consist of all the market segments identified. The largest potential market segment for PCCPM to be serviced by fertilizer blenders is the home garden/retail market, accounting for 900 to 1500 tonnes of blended fertilizer, annually. The institutional market (golf courses, parks, school yards, recreation and cemetery sites) for blended fertilizers containing PCCPM is estimated in the range of 450 to 750 tonnes. Vegetable market gardeners are indicated to represent a further 90 to 150 tonnes of potential demand for blended fertilizers containing PCCPM product.

PCCPM also has the potential for long term growth as an enhanced product to meet special circumstances through the addition of nutrients prior to pelleting. As this is not a current or close market it is not considered in this review.

7.1.1 Specific Message

This composted, pelleted and crumbled product provides an exceptional organic base or filler for chemical fertilizers as it contains a minimum of 5-4-5 NPK (thus decreasing the chemical component to meet the guaranteed analysis) at a cost below other organic fillers.

Although higher priced than ground limestone the benefits (including the antigen factors associated with a properly composted product, the NPK addition, the levels of micronutrients and the nutrient time release of an organic product) more than make up for the slight increase in cost.

The product is available in both a standard and greens grade size so blends exceptionally well with either size of chemical prill, is virtually odourless and maintains its particle integrity with very little, if any, fines.

With the research which has been done on this product the company is prepared to offer a full guarantee on all these factors including the fact that the product, on its own, is completely non-burning.

In addition, PCCPM is available either pre-bagged or in bulk for private label bagging for sale as a 100% organic fertilizer with an analysis of 5-4-5.

7.1.2 Information Channels

As there are only a few fertilizer blenders in the immediate market area the information should be transmitted directly to them by the use of formal and informal meetings, product introduction

brochures, research reports, and testimonials from persons who have tried the product as a stand alone fertilizer. Arrangements should be made to have the researchers who have conducted the testing of the products contact the fertilizer blenders directly to answer any questions they may have regarding that process. This process should then be duplicated as blenders in other markets are contacted.

7.1.3 Motivation For Purchase

The motivation for purchase is the banquet of benefits that the composted product provides to a fertilizer traditionally filled with limestone while at a price below competing organic products.

7.1.4 Coordination Of Distribution

The distribution of the product from the plant to the blenders should be in sufficient volumes to allow direct bulk deliveries where possible. Where volumes are such that bulk containers are impractical large sized bags (25 kg) should be used.

7.1.5 Follow Up

The follow-up necessary for this product and market will be constant. New exciting growth or remedial results should be communicated as they occur. Training on the use and benefits of the product should be provided to all the field staff for the blender(s) with materials available to them to hand to end users and garden centres purchasing from them.

7.2 COMMERCIAL ORGANIC PRODUCERS

This market is judged to be so insignificant as to not require the development of a marketing strategy at this time. Current organic producers are primarily manufacturing their own composts and are using small amounts of supplements such bone and blood meal. As the organic production grows it will become part of the mainstream markets for 100% organic fertilizers which are being sold in small amounts through retail garden centres today.

7.3 HOME/GARDEN CENTRE RETAIL & FERTILIZER DISTRIBUTORS

Of the total garden centre retail/fertilizer distributor market for PCCPM, 85 % may be serviced by product originating from fertilizer blenders (as identified previously) and amounting to a potential demand for PCCPM product through this market channel in the range of 900 to 1500 tonnes, depending on price assumptions. This leaves 15 % of the potential demand in this market segment which is considered potentially accessible to direct-marketed PCCPM product, indicating a direct market in the range of 159 to 265 tonnes, annually.

The total potential volume of PNO products to be marketed through centres and distributors, including both fillers and organic based products, is estimated at between 1604 and 2310 tonnes. These figures include anticipated demand for PCCPM from all market channels and estimated quantities of PNO products currently being sold in these market segments.

The USA National Gardening Survey, 1993-94 includes detailed breakdowns of the types of gardening for which supplies are purchased. This indicates that the real growth in supplies sales (including fertilizers) is in the areas of landscaping, container gardening, lawn and tree care rather than in traditional vegetable gardening and indoor plant care. This is reflected in the types of products being sold through the retail garden centres. It is interesting to note that almost twice as many households purchase weed and feed fertilizer as purchase either regular or liquid fertilizers and only 25 % of that number purchase organic fertilizers.

7.3.1 Specific Message

This organic product is ideally suited for customers who wish to do their part to be ecologically sensitive and produce a superior growing environment for their plants and grasses. PCCPM has a very reasonable nutrient profile including significant quantities of micronutrients. Although the percentage of composition for each individual primary nutrient (NPK) may not appear as high as other products on the market, as an organic product PCCPM has natural nutrient time release characteristics which provide extended availability for the plants. Thus while the greening may not appear over night as with chemical fertilizers it will develop stronger and be longer lasting with less stress on the plants.

PCCPM has been fully tested in both research and commercial applications and has demonstrated superior growth factors and impressive consistency from batch to batch. It has experienced absolutely no burning problems even when placed on newly planted grass and being a composted

product exhibits antigen factors reported by federal researchers.

The product is available in both a standard and greens grade size so can be used in a variety of circumstances and with a range of spreaders. It is virtually odourless and maintains its particle integrity with very little, if any, fines.

Both the packaging for PCCPM and the promotional materials provided include specific information on the product, recommended quantities for use with a range of crops and directions for application.

As well as a 100% organic stand alone product, PCCPM is used extensively to enhance the time release characteristics of a number of fertilizer blends which are marketed as "PCCPM organic base" fertilizers. These products may provide the faster greening that some customers require as well as some of the time release, micronutrients and other factors that PCCPM can provide. Of course an organic based product will not satisfy those who desire a 100% organic on aesthetic grounds and PCCPM will fill the bill for them.

7.3.2 Information Channels

Garden centres and fertilizer distributors receive much of their information from the fertilizer blender reps who service them and from customers who report on product characteristics and results. Thus the primary channel for getting the message to them is either direct from the manufacturer, either by printed material or, more likely, by direct contact or through the fertilizer blender representatives who call on them on a regular basis. Specific information on results of tests and commercial applications, including pictures, is very important for this market segment as they deal on a very visual basis with their customers.

7.3.3 Motivation For Purchase

PCCPM is an organic fertilizer with relatively high nutrient components, that is backed by impressive research results, is non-burning in all circumstances and retails at a price which is below other organic fertilizers and many of controlled release chemical fertilizer products.

7.3.4 Coordination For Distribution

The product is available through the fertilizer blenders or may be purchased direct from the manufacturer. No attempt will be made to develop local warehousing for the product outside of

that provided by the blenders, garden centres or distributors themselves.

7.3.5 Follow Up

Scheduled follow-up with all retails and distributors should be made to ensure that any problems, no matter how minor they may seem, are dealt with quickly and professionally. One firm talks of a "no quibble guarantee" and that is how the business must operate if it is to prosper. It also means that internal controls must be such that any problems shouldn't leave the plant as they will cost much more when handled later.

New information on uses and results should be transmitted to all customers as they are received. Each provides another opportunity to promote the product, provide additional sales ammunition for the front line centres and distributors and a chance to top up the order that might be ready but not placed.

7.4 VEGETABLE MARKET GARDENERS

Industry sources have suggested that this segment of the market accounts for fertilizer sales which equal about 10% of the product moving through the garden centres. Based on this rationale, the vegetable market gardening market segment may currently represent a PNO product market of about 60 tonnes, annually. The potential yearly markets for PCCPM fillers and direct marketed PCCPM are estimated to be in the range of 90 to 150 tonnes and 16 to 26 tonnes, respectively. The total PNO market in the vegetable market gardener market is estimated to be in the range of 161-231 tonnes, annually. Sufficient motivation for purchase by this sector could therefore provide access to a significant market.

7.4.1 Specific Message

This market operates on a very similar level as the retail garden centres although they will be more receptive to research results as they are used to dealing with the agricultural research and extension services. The group is not homogeneous. Some will be attempting to reduce chemical inputs as far as possible while others will simply be looking for the production method that produces the largest volume in a given time. This will be reflected in their selling methods as well as their production. As such the general messages outlined under retail garden centres and fertilizer distributors will also apply to this market.

7.4.2 Information Channels

Vegetable market gardeners receive much of their information through their suppliers be they garden centres, fertilizer distributors or fertilizer blenders but also rely to a large extent on agriculture extension agents. All of these then become channels through which information on PCCPM should be directed to the market.

7.4.3 Motivation For Purchase

The motivation for purchase will be the opportunity to purchase a superior organic or organic based product which is backed by impressive research at a competitive price.

7.4.4. Coordination Of Distribution

Much of this product will be sold either through garden centres, distributors or blenders. In those exceptional circumstances where product may be ordered direct the firm will need to deliver direct. If this is not possible or profitable customers should be encouraged to order from the distributors already in place.

7.4.5 Follow Up

Market gardeners are usually knowledgeable respected growers whose recommendations could be effective in winning over other producers or home gardeners. Effective follow-up on a yearly basis with at least some of the larger market garden users of PCCPM could provide those recommendations. As well it provides the opportunity to solve problems and create a service image for the company.

7.5 LANDSCAPERS AND LAWN CARE FIRMS

This market is of negligible value due to the lack of incentive to move to organic or organic based fertilizers. The firms are most interested in quick results with repeat applications necessary and therefore use lower priced, higher nutrient formulations with high density (allows more product to be carried on the truck). These firms use organic products only when specifically requested (at a price) or when they have a situation requiring soil amendment as well as nutrient inputs.

7.6 GOLF COURSE SUPERINTENDENTS

This fertilizer sector is significant, easily identifiable, and one which all blenders and distributors target. As Summary Table 1 indicates (p.3, above), the golf course market is one of several in the institutional market segment. The potential market for PCCPM as a filler in blended products is estimated to be in the range of 113 to 188 tonnes, annually. The potential market for direct marketed PCCPM to golf courses may amount to a further 20 to 33 tonnes.

The current annual market for PNO products in the institutional market segment, of which golf courses is one sector, is indicated to be 500 tonnes. The Summary Table suggests that the total potential demand for PCCPM and other PNO products combined may be about double the current use of PNO products in the Lower Mainland of B.C.

7.6.1 Specific Message

PCCPM is a 100% organic product backed with stringent research and commercial testing. The product is available in both standard and greens grades with both having an analysis of 5-4-5. Being organic it has been shown that these nutrients are released much more in tune with plant growth requirements therefore significantly reducing nitrogen leaching through the sand base of greens and tees and producing on going grass production normally associated with much higher analysis fertilizers.

On a cost/value basis PCCPM is very competitive.

As a composted product PCCPM also brings a number of micronutrients to the mix as well as other beneficial antigen factors. The product is guaranteed to be non-burning and is viewed very positively by a large segment of society as being environmentally sensitive for both its non-polluting and recycled product characteristics. This latter factor has proven to elicit positive reaction from golf club members (as long as the grass is in top shape).

7.6.2 Information Channels

The primary information channel for golf course superintendents are other superintendents so materials aimed at this market should include endorsements from the course superintendents where commercial testing of the product was carried out. As new courses are added to the user lists endorsements should be solicited from them to add to the arsenal as new golf courses are targeted.

The next source of information for this group comes from the fertilizer reps who call on them. In this case it is first important to have the reps themselves on side. (This can be a problem if the PCCPM produces a lower margin than chemical fertilizers). Once willing to sell the product the reps need a full range of research information, testimonials and written guarantees in order to move their prospective customers to the PCCPM.

7.6.3 Motivation For Purchase

The main motivation for purchase will be to secure a product which will produce longer lasting, more durable, better looking tees and greens with other uses being secondary. Samples that can be tested on the course by the superintendent will assist in securing long term purchasing commitment.

7.6.4 Coordination Of Distribution

Distribution will be carried out either direct to the golf course or through the fertilizer blender or distributor handling the sale. As potential volumes are significant distribution should not be a problem.

7.6.5 Follow Up

Follow-up by the manufacturer with this group is imperative as being large volume fertilizer users they may or may not be receiving the straight goods about your product from the blender or distributor reps. Therefore direct reality checks are necessary. This is also a good way to both solicit testimonials and deal with problems directly.

7.7 RECREATION FACILITY/PARKS/SCHOOL YARD & CEMETARY MANAGERS

These managers are professional but conservative in their approach to fertilizer use both due to constant budget constraints and a desire to not make mistakes which could come back to haunt them. Consequently they are usually slow to accept new products or methods of use.

The recreation facility, parks, schools and cemeteries sectors are presented as components of the institutional market segment in Summary Table 1 (p.3, above). As indicated in the Summary Table, the filler market represented by the fertilizer

tonnage used the institutional market segment is relatively significant in terms of current PNO use. However, the accessibility of the filler market to PCCPM is considered extremely dependent on demonstrating low cost and trouble-free performance of PCCPM products in specific uses and applications.

The potential market for PCCPM in these sectors is estimated to be about 337 to 562 tonnes, annually, in the filler market (i.e., about 75 % of the institutional market for fillers) plus a further 59 to 99 tonnes which may be marketable directly to end-users.

7.7.1 Specific Message

The message necessary to win over this market segment is irrefutable proof that PCCPM has been fully tested and provides superior results in recreation or playground applications with lower yearly costs (product and application). The product also has produced spectacular results in use with flowers and shrubs in park settings.

7.7.2 Information Channels

As with other groups recreation and parks managers listen to their peers. Testimonials from one can be used with others. As well they receive a significant amount of information from fertilizer reps and therefore a well armed rep can assist immensely in breaking into this market.

7.7.3 Motivation For Purchase

The primary motivation is production of good quality fields, lawns and beds within the budget allowed. If any "environmentally friendly" brownie points can be earned at the same time that is a bonus.

7.7.4 Coordination of Distribution

Although most parks and recreation purchasing is done by tender they may not take all of the tender into their storage at one time. This then requires that a local fertilizer distribution firm be the primary bid contractor so that the product can be drawn from them on an as needed basis.

7.7.5 Follow Up

As with the golf course superintendents follow-up should be scheduled on a regular basis to both ensure that the message of PCCPM is getting through and that any little problems are being handled before they become big problems.

7.8 CONVENTIONAL FARMERS

This market segment of the British Columbia fertilizer market is one of the more difficult for PCCPM to access. Most farmers have opportunity to use various manures on an as needed basis with fertilizers added for certain crops, specific growth periods or production circumstances. They therefore see little sense in paying extra for organic or organic based products when they can add the raw material directly. The only event which will turn this around would be a prohibition against spreading of raw manures for environmental reasons. Even then we would probably see simple composts as the product of choice for replacing the raw material on the land.

7.9 SERVICE CLUBS - as fund raiser

This is a potential market but one more realistically associated with the raw compost. Requirements for a good fundraiser is that the product should be relatively low priced, provide significant mark up, be easy to use, be a recognizable product and not require special handling or application. Although PCCPM could meet most of these requirements, a full term compost would be more recognizable and probably cheaper. There is, however, potential for PCCPM using this marketing method as it gains more recognition in the gardening community. The firm may wish to start through the selling of bagged compost and then move the service clubs into the value added PCCPM at some future date.

8.0 MARKETING PROGRAM TIMING

8.1 DEVELOPMENT STAGE

The development stage for this product should include test production (using the actual compost and equipment that approximates the production line proposed) and significant testing of the finished product to discover its attributes and remove any problems. This should involve testing in both research (Agriculture Canada) and commercial (farm, lawn and garden, golf course) circumstances as well as testing of development of fines or dust in normal handling, the integrity of the various sized products, odour abatement mechanisms, etc.

If the product is to be viewed as something more than a manure or even composted manure product (low cost, limited effectiveness, good soil amendment) it must have sufficient research behind it to set it apart. Even though the primary marketing strategy is targeting a filler market, the benefits must be fully visible or the tendency will be to stay with the limestone they are presently using which provides weight without bulk. If we wish to replace existing organic products in the "organic based" market we will need to compete with the research that each firm has produced, as well as their prices.

In addition, the written or visual materials to be used in the introduction will need to be developed. These should include significant numbers of either research or test user quotations to back up the claims which will be made. Graphics for bags or bulk containers should be developed and ordered in sufficient quantities for the introduction. This period can also be used for further costing and product review with selected end users to continue to confirm the perceptions of the proponents.

Due to the seasonal requirements of growth response testing this development stage should be in place for at least one growing season before company moves to the introduction stage. An exception could be the introduction to the filler market where the PCCPM is to be used for replacing limestone. Some preliminary testing of the PCCPM would need to be done to ensure that the granules will not break down, that the product will not result in burning of crops, that the odour is within the acceptable limits of the blenders to which it is introduced and that the analysis of the PCCPM is consistent from batch to batch. If, however, the product is to be identified in the blend (eg. "organic based fertilizer with PCCPM") the research results will be necessary prior to that identifier going on the bag.

8.2 INTRODUCTION STAGE

Once the products have been fully tested for both physical attributes and growth characteristics (including potential for burning) the product should be introduced to the fertilizer blenders in the immediate market area as a replacement for their organic or limestone fillers, or both. Coincidentally with that discussions should take place with those firms who purchase private brand products from those fertilizer blenders to inform them of the availability of the product, its attributes and the fact the proponents are in the process of offering it to their suppliers who could, if desired, place the PCCPM into their product mix. Pricing, of course, would only be discussed with the blender.

As we believe this is not only the largest but the most viable market for this product we recommend that the introduction stage key on the blenders and the firms to which they provide private label or special blends (for large end users). Without the blenders using PCCPM as a base or filler for at least some of their products there will not be sufficient volume to justify the development of a plant.

The introduction stage can vary anywhere from a couple of months to a year or more. The key is the speed at which problems identified are corrected to reach that point when all aspects of the business are running effectively and efficiently. Only when that has been achieved should the business move on to the next stage, the introduction to other markets where the product is marketed as a stand alone fertilizer product.

8.3 GROWTH STAGE

NOTE:

Although the B.C. market for PNO products used as conditioners, fertilizers or fillers is estimated to be in the range of 2809 to 3953 tonnes, annually, the potential market for PCCPM is considered substantially smaller at this time, in the range of 1694 to 2823 tonnes. Price, product quality and product recognition will be key factors determining whether PCCPM can penetrate current PNO markets held by competing products. As the PCCPM plant envisioned would have an output capacity of 8,000 tonnes on a one shift per day basis, the marketing plan will require development beyond the B.C. borders.

After the introduction stage with the fertilizer blenders and private label retails and distributors the growth stage will move into the development of the other identified markets such as the golf

course and recreation markets, the retail garden centres and the vegetable market gardeners. In addition it is at this time that testing of the product for use in indoor plant applications should be carried out. This may lead to the sale of PCCPM in containers more suited for in home storage and use.

Concurrently with the development of further markets in B.C. the potential filler markets in both Alberta and Washington State should be investigated. The experience gained in the introduction to B.C. blenders should provide the information and approach to achieve market penetration in both regions with Oregon and California to follow as the Washington and Alberta introductions turn into the growth stage. Blenders in these regions currently use a variety of organic products, including composts, in the development of their products. Additional competition will be felt from the established organic fertilizer producers in the region but, as in B.C., it appears that the market for these products are expanding, albeit at a slow rate.

The growth of the markets can continue with one building on the successes achieved in the other and no movement into a new market until fully tested and introduced in that market segment in the previous geographic region.

The reason for not entering a number of regions simultaneously is the need to develop the increased production in a step wise fashion plus develop and fully test the distribution systems into one market before moving on to the next. If spread too thin a problem with either product or distribution can kill a huge market area with negative word of mouth advertising. If dealing with a more manageable geographic region the problems can be handled more quickly, reducing the negative advertising.

8.4 MATURITY STAGE

This product will reach maturity when it is fully accepted by the markets in western Canada and the western USA and the plant capacity has been reached. This may be complicated to some extent by a perception that the market for organic products will continue to grow suggesting that at some point the plant production may be overcommitted if markets are found to achieve full production and then those markets grow. This is, however, a problem that almost any business would like to have as the raw materials for the end product are not likely to be in short supply.

8.5 DECLINE STAGE

This stage is usually a major concern for products which expect a level of obsolescence. In this case there does not appear to be technology on the horizon which would replace organic fertilizers

in the near future. Instead it appears likely that research into the "other factors" of composted poultry waste may suggest increased use for the foreseeable future, not a decline.

9.0 EVALUATION

The marketing plan for PCCPM requires, as any good plan must, scheduled periodic evaluation to both determine the adherence to the plan and provide for plan corrections as new information and experience is brought to light. Thus the plan should be reviewed in depth each year with six month updates of key information. Any significant change in assumptions governing the plan should lead to an immediate review to determine if major changes are required to deal with the situation.

APPENDIX I
MARKET RESEARCH REPORT

TABLE OF APPENDIX I CONTENTS

1.0	OVERVIEW OF FINDINGS	I-2
2.0	NOMENCLATURE	I-3
2.1	Fertilizers and Supplements	I-4
2.2	Organic Matter	I-4
2.3	Processed Natural Organic Fertilizers	I-4
2.4	Certified Organic Fertilizers and Supplements	I-4
2.5	Organically-Based Fertilizers	I-4
2.7	Slow Release and Controlled Release Fertilizers	I-4
3.0	FERTILIZER REGULATION AND CONTROL	I-6
3.1	Canadian Fertilizer Regulation	I-6
4.0	CONTROLLED RELEASE FERTILIZER PRODUCTS AND CHARACTERISTICS	I-7
4.1	Manufactured CRF Products	I-7
4.1.1	Products	I-7
4.1.2	Characteristics	I-7
4.2	Processed Natural Organic (PNO) Fertilizers	I-11
4.2.1	Products	I-11
4.2.2	Characteristics	I-11
5.0	CURRENT SUPPLY AND DISPOSITION: RAW POULTRY MANURE PRODUCT	I-18
5.1	Local Supply of Poultry Manure	I-18
5.2	Disposition of Poultry Manure	I-18
6.0	DEMAND FOR PROCESSED NATURAL ORGANIC (PNO) FERTILIZERS ...	I-18
6.1	Previous Estimates of the Slow Release and PNO Fertilizer Markets ...	I-19
6.1.1	Use of Poultry Manure Products	I-19
6.1.2	Previous Assessments of PNO Product Markets	I-19
7.0	CHARACTERISTICS OF THE MARKET FOR PROCESSED POULTRY MANURE PRODUCT	I-21
7.1	Raw Material to Plant	I-22
7.2	Controlled Release Additives	I-24
7.3	Product Odours	I-25

7.4	Product Form and Analysis	I-26
7.4.1	Terminology	I-26
7.4.2	Product Analysis	I-28
7.5	Quality Control	I-31
7.6	Markets	I-32
7.6.1	Conventional Farms	I-32
7.6.2	Organic Farms	I-32
7.6.3	Horticultural Market	I-33
7.6.4	Institutional Market Segment	I-34
7.6.5	Home/Garden Retail Market Segment	I-34
7.6.6	Vegetable Market Gardeners	I-35
7.6.7	Mine and Landfill Reclamation	I-35
7.7	Price Indicators	I-37
7.8	Price Sensitivity	I-37
SECTION A: NOMENCLATURE		I-40
SECTION B: FERTILIZER REGULATION AND CONTROL		I-45

ANALYSIS OF THE MARKET FOR COMPOSTED PELLETED POULTRY MANURE PRODUCT

This Appendix reports on the market research component of the project. Prior to conducting a survey of potential PCCPM users in B.C. and developing a market plan and strategy, an extensive investigation of controlled release products and organic fertilizer products was undertaken. The effort included a discussion of the terminology employed in describing organic fertilizers and an overview of the legal and regulatory requirements associated with the manufacture, registration and marketing of PCCPM products in Canada.

In addition, major North American manufacturers of processed natural organic products, which are potential competitors with PCCPM product, were contacted and interviewed with respect to existing market conditions for this class of fertilizer products. The investigations provided the basis for identifying a range of product characteristics and market orientation which may be anticipated to lead to successful marketing of PCCPM.

1.0 OVERVIEW OF FINDINGS

This report represents the results of investigations into the market for controlled release fertilizers (CRFs) and, more particularly, processed organic materials with inherent controlled release properties.

The major findings at this stage of market research and investigation are:

1. High quality composting is a critical attribute of a processed poultry manure product which can successfully compete in existing markets. Poor physical characteristics (such as strong odours, sterility, and presence of pathogens) limit the flexibility, effectiveness and acceptability of the product in all end uses. such as a soil conditioner, a filler, or "high end" ingredient of fertilizer mixes.
2. The characteristics of a high quality pelleted, processed poultry manure would include:
 - homogeneity of particles
 - physical resistance to breaking down during transportation, handling, storage and application
 - dust-free
 - absence of mal-odour
 - no phytotoxicity
 - pathogen- and weed- free
 - measurable and consistent nutrient analysis
 - predictable behaviour in intended applications.
3. There is market potential for a composted, pelleted poultry manure product positioned in two market segments. These market segments are the home/garden retail sector and the institutional sector. However, access to these markets should occur through direct marketing to retail outlets and as a supplier of "filler" product to fertilizer mixers and distributors. To service these market segments, the pelleted product could be differentiated into at least two product lines.
4. The markets for processed poultry manure products are served by a small number of industry players and governed by distributor-oriented marketing systems locally, nationally and continent-wide. A significant portion of "high end" uses of composted poultry manure products is in products mixed by fertilizer distributors for custom applications. One implication of this structure is that producers of organic products may not know where or how their products are ultimately used. A second implication is that it is likely to be difficult for the poultry

manure processor to develop "pull through" marketing for his product in retail markets.

5. Although there is a slow trend towards the use of higher valued products, the home/garden retail market is largely insensitive to marketing factors other than price.
 - An unfortified, composted, pelleted poultry manure product could enter the market for "fillers" in lower analysis fertilizer mixes sold into the home/garden retail sector. This product would compete at the wholesale level with limestone (\$50-60/tonne). A high quality composted, pelleted poultry manure product may have the potential to develop a niche in the filler market currently occupied by "higher end" organic products.
 - A fortified, composted, pelleted poultry manure product, e.g., 4-(1-2)-(2-3) bagged directly for the home/garden retail sector could potentially capture 5-10% of the market for bagged composted manures used as soil conditioners and low analysis garden fertilizers, at a delivered "net back" price to the producer of \$150/tonne. The potential for custom blending and pelleting of fortified organic products for specific fertilizer dealers and distributors would appear significant.
6. The institutional sector (playing fields, parks, golf course, cemeteries) is a more sophisticated market for fertilizers. This sector is knowledgeable of the benefits of higher quality products and the advantages of controlled release properties.
 - There is potential market share for a size segregated, composted, fortified, pelleted poultry manure product to compete in the filler market with high performance organic-based products from Minnesota and Alberta. Typical analyses used in the sector are 5-2-5, 5-2-4, 5-4-3, etc.
7. A market for an "organic" fertilizer product is not sufficiently developed at this point in time. Commercial organic producers account for less than 500 acres in B.C. End users in retail markets will not pay the extra price for organic products. Lawn maintenance customers want the quickest reaction to fertilizers at the lowest price.
8. The North American market for "organic-based" fertilizers is growing in "high end" specialty uses such as in fertilizer mixes for professional turf and golf course tees and greens. Organic ingredients have advantages in these applications related to enhanced microbial activity, disease control and presence of micro-nutrients. However, these properties have not been scientifically verified and therefore, can not be claimed.
9. Significant marketing opportunity is identified by adding value to poultry manure product through further-processing. However, the bulk market for the value-added product appears hold more potential than the bagged or boxed options, possibly indicating that the greater emphasis on value-added should be on product quality rather than packaging and advertising considerations.

2.0 NOMENCLATURE

Various terms are used in this report. The following definitions are provided to assist the reader. A detailed description is presented in Section A, p.I-39.

2.1 Fertilizers and Supplements

The Fertilizers Act of Canada defines a fertilizer as "... any substance or mixture of substances containing nitrogen, phosphorus, potassium or other plant food, manufactured, sold or represented for use as a plant nutrient".

2.2 Organic Matter

Organic matter is defined in the Fertilizers Act as "... that substance of animal or vegetable origin remaining after the removal of the moisture and total ash fractions". Only products that are solely derived from organic matter may be identified or described as "organic".

2.3 Processed Natural Organic Fertilizers

U.S. fertilizer literature may also make reference to "processed natural organic fertilizers". This class of fertilizers includes dried blood, castor pomace, compost (composted plant material and sawdust), cottonseed meal, dried manure, activated and other processed sewage sludge, tankage and other organic materials which are by-products of animal or vegetable substances. Although application of raw manure on croplands is a major use of animal manures, only that portion which is collected, dried and sold as fertilizers is included in the class of processed natural organic fertilizers. The effect of processing is to concentrate the nutrient content of the organic end product from generally less than 5% nitrogen in the raw product to greater than 5% nitrogen in the processed product, often by fortification with chemicals.

2.4 Certified Organic Fertilizers and Supplements

Urea reaction products, which represent the base material for the bulk of controlled release products, are organic nitrogen compounds albeit synthetically produced. Nonetheless, controlled release fertilizers based on urea reaction products (see below) are prohibited as a source of nitrogen in the production of certified organic products. The use of elemental sulfur is discouraged and subject to regulation. A list of sources of plant nutrients which are considered organic is presented in Appendix A.

2.5 Organically-Based Fertilizers

The Canadian definition of an "organically-based" fertilizer is a product which contains at least 15% natural organic matter. The analysis must carry a guarantee for the minimum amount of organic matter (Trade Memorandum T-4-106).

2.7 Slow Release and Controlled Release Fertilizers

Fertilizers designated as "slow release" fertilizers have delayed nutrient release characteristics in the soil.

The AAPFLO uses the terms 'slow release' and 'controlled release' interchangeably to describe fertilizers which contain slowly released plant nutrients and no fertilizer label shall bear a statement that connotes or implies that certain plant nutrients contained in a fertilizer are released slowly over time, unless the nutrient or nutrients are identified and guaranteed. The terms "water insoluble", "coated slow release", "slow release", "controlled release", "slowly available water soluble" and "occluded slow release" are considered to apply to the same class of fertilizers.

Fertilizers which are recognized as products with slow release properties include:

- Water insoluble (N products only), such as natural organic materials, ureaform materials, urea-formaldehyde products, IBDU, oxamide, etc.
- Coated slow release, such as sulfur coated urea and other encapsulated soluble fertilizers
- Occluded slow release, where fertilizers or fertilizer materials are mixed with waxes, resins, or other inert materials and formed into particles
- Products containing water soluble nitrogen such as ureaform materials, urea-formaldehyde product, methylenediurea (MDU), dimethylenetriurea (DMTU), dicyanodiamide (DCD), etc.
- Organic nitrogen products where the water insoluble nitrogen guarantee must not be less than 60% of the nitrogen in organic form equivalent to X% N present in the fertilizer.

3.0 FERTILIZER REGULATION AND CONTROL

3.1 Canadian Fertilizer Regulation

The Minister of Agriculture and Agri-Food Canada is responsible for the administration of the Fertilizers Act, the legislation for the regulation and control of agricultural fertilizers in Canada. Composts and processed sewage are within the purview of the Act and must meet specific criteria and standards for safety and efficacy. The regulations deal with requirements in the following areas:

- Need for registration
- Fertilizer content standards
- Guaranteed analysis and tolerances
- Labelling
- Units of measurement
- Testing requirements.

Canadian Ministry of Agriculture chemists, toxicologists and other scientists are represented in the Association of American Plant Food Control Officials (AAPFCO), a group consisting of federal, provincial, dominion and state experts which is formed to make fertilizer terminology more uniform and to make regulatory recommendations. Canadian regulators support the terminology and standards developed by that organization.

Issues relating to composted organic fertilizers are currently being jointly addressed at the federal level by the Standards Council of Canada, Canadian Committee of Ministries of the Environment and the Department of Agriculture. The objective is to develop quantitative specifications and standards for compost relating to pathogens, minerals, stability, organic and inert contaminants. These criteria will become a voluntary national CSA standard, requested by industry to ensure that only high quality products are placed on the market.

Agriculture Canada, Food Production and Inspection Branch, has prepared Trade Memoranda to assist in the interpretation of the Fertilizers Act and Regulations. Two of these documents pertain to organic products and processed sewage and by products¹. Trade Memorandum T-4-93 lists maximum acceptable metal concentrations in processed sewage, sewage-based products and other by-products² with a total nitrogen content of 5% or less represented for sale as fertilizers or supplements. Trade Memorandum T-4-106 provides a further interpretation of organic fertilizers as defined under the Fertilizers Act.

Further detail on regulations pertaining to processed natural organic products is presented in Section B, p. I-44.

¹Trade Memorandum T-4-93. April 26, 1991. Metal concentrations in processed sewage and by products. Trade Memorandum T-4-106. April 10, 1991. Organic fertilizers under the Fertilizers Act.

²These include, but are not limited to composted manure, municipal waste tankage, garbage tankage, leather tankage, industrial sewage.

4.0 CONTROLLED RELEASE FERTILIZER PRODUCTS AND CHARACTERISTICS

In this report, fertilizers with "slow release" and "controlled release" characteristics are referred to collectively as "controlled release fertilizers" (CRFs). This terminology is consistent with the definition used in the industry.

Controlled release fertilizers (CRFs) can be differentiated into manufactured and processed products categories. Manufactured CRFs fall generally into the class of synthetic organic controlled release nitrogen compounds, although CRFs can refer to compounds composed of the two other major plant nutrients, phosphorus and potassium.

Processed natural organic (PNO) CRFs are by-products of the processing of animal or vegetable products that contain major plant nutrients in sufficient concentration so as to be represented as fertilizers.

The volumes and values of North American commercial production of CRFs are presented in Table 2.

4.1 Manufactured CRF Products

4.1.1 Products

Manufactured CRFs vary in terms of nutrient content, rate of nutrient release (e.g. water-insoluble or slowly available nitrogen content), and solubility in relation to soil moisture, temperature, pH, nutrient supply and aeration. Essentially, nutrients from urea-aldehyde products are released by microbial activity in the soil. The breakdown characteristics of compounds can be extended either by modifying the chemical characteristics of the product (i.e., lengthening of the polymeric chains containing nitrogen) or through the use of coating compounds which delay or retard the breakdown of soluble compounds containing plant nutrients.

In general, manufactured CRFs offer advantages over processed natural organic fertilizers in terms of physical integrity and chemical uniformity, higher nutrient analysis, and more designable handling characteristics.

4.1.2 Characteristics

1. Urea-aldehyde reaction compounds³ containing no other plant nutrients other than nitrogen, with analyses in the range of 18-0-0 to 41-0-0.
 - **Product:** Ureaform.
Analysis: 38-0-0. Longer urea formaldehyde polymers.
Characteristics: As defined by the AAPFLO, ureaform must contain at least 60% of their nitrogen in cold water-insoluble nitrogen form and have a nitrogen availability index of not less than 40%.
Major Uses: As an ingredient for blended fertilizers and solid fertilizer mixtures in golf courses, home lawns, ornamentals and selected agricultural crops.
Minor Uses: Direct application to professional turf.
Suppliers: Pursell Industries, Inc., Alabama (product Nitrazine). The Scotts Company, Ohio (product Turf Builder). Omnicology, N.Y (product UF 38).

³Grouped here are ureaforms, methylene ureas, MDU/DMTU, urea-formaldehyde suspensions and solutions and urea-triazone solutions.

- **Product:** Methylene urea.
Typical Analysis: 40-0-0. Intermediate chain-length polymers.
Characteristics: Cold water-insoluble nitrogen may range between 25-60%.
Major Uses: As a component of granulated mixed fertilizers for direct application.
Minor Uses: As single nutrient ingredient, used in blended speciality fertilizers, where urea formaldehyde concentrate is reacted with other fertilizer materials in the granulation process. Granulated mixed fertilizer are also be used as a base for homogenous blended lawn and turf fertilizers.
Suppliers: Nor-Am Chemical Co., Delaware (product Nitroform, Nutralene). The Scotts Company, Ohio (product ProTurf HD). Omnicology, N.Y (product UF 40).
- **Product:** Methylene-diurea (MDU)/Dimethylene triurea (DMTU).
Analysis: > 40-0-0. Shorter chain polymers.
Characteristics: Less than 25% of nitrogen is in cold water-insoluble nitrogen form. Higher proportion of unreacted urea in lower molecular weight polymers.
Uses: Major use is direct application to lawns and turf, minor use is in blending with other fertilizer materials in a granulation process.
Suppliers: The Scotts Company, Ohio (products Scotts, Triaform).
- **Product:** Suspension methylene ureas.
Analysis: (18-25)-0-0.
Characteristics: Approximately 25% of nitrogen is cold water-insoluble.
Uses: Major use is direct application in liquid form to lawns and turf in hot weather. Increasing US use in fertigation and soil and foliar applications to tree crops. Product is also used to increase fruit size, retain fruit set, and to increase the number of leaves on trees.
Suppliers: Georgia-Pacific Corporation (products RESI-GROW, GP-4318).
- **Product:** Urea-formaldehyde solutions.
Analysis: (26-30)-0-0.
Characteristics: These are clear-water solutions which, while not containing water-insoluble nitrogen, have extended nitrogen release characteristics due to the presence of unreacted urea in low molecular weight polymers.
Uses: Major use is direct application in liquid form (and see suspension methylene ureas, above).
Suppliers: Borden Inc. W.A. Cleary Corporation, New Jersey (product FLUF 16-2-4). CoRoN Corporation, Pennsylvania (product CoRoN). C.P. Chemical Company Inc., N.Y. (product Nitro-26-CRN). Georgia-Pacific Corporation (products GP-4340, GP-4341). Hickson Kerley, Inc., Arizona (products Formolene Plus).
- **Product:** Urea-triazone solutions.
Analysis: 28-0-0.
Characteristics: This is a patented product providing extended nitrogen release characteristics because of its unique closed ring configuration of the urea fomaldehyde-ammonia component.
Uses: Liquid product designed for professional application to lawns and turf, foliar application to high-value specialty crops (and see suspension methylene ureas, above).
Suppliers: Hickson Kerley, Inc., Arizona (products N-Sure, Trisert).

2. Isobutyraldehyde reacted with solid urea.

- **Product:** Isobutylidene diurea (IBDU)
Analysis: 31-0-0.

Characteristics: 90% of nitrogen is in water-insoluble form.

Uses: Used alone or incorporated in mixed fertilizers for golf greens and other turf. Also marketed to commercial growers of strawberries, tomatoes, bell peppers, young citrus trees, watermelons, cranberries and other high value agricultural crops.

Suppliers: Vigoro Industries Inc., Florida (products IBDU, ParEx, Woodace, Certified Harvest King).

3. Acid-catalyzed reaction of urea with acetaldehyde.

- **Product:** Crotonylidene diurea (CDU)

Analysis: 32-0-0.

Characteristics: Release characteristics affected by particle size, temperature, moisture, pH, soil acidity. Slower releasing than IBDU.

Uses: Golf courses.

Suppliers: Imported from Japan by Helena Chemical Co., Tennessee (product Meister).

4. Coated Fertilizers

Coating of soluble fertilizer materials with semipermeable or impermeable membranes creates slow release characteristics. Coatings may simply be a barrier between the soil and the fertilizer or function additionally as a source of plant nutrient. Coated fertilizers include:

- **Product:** Sulfur-coated urea (SCU).
Analysis: 37-0-0-16. Encapsulation of standard granulated urea with sulfur and sealant (wax).
Characteristics: SCU products are described in terms of a seven-day dissolution value. Most SCU products are designed to release 20-33% of nitrogen in seven days.
Major Uses: Most SCU is blended for professional lawn care and landscape maintenance.
Minor Uses: Consumers and golf courses, "premium" lawn fertilizers.
Suppliers: Terra International (Canada) Inc., Ontario. Pursell Industries Inc., Alabama (product TriKote). The Scotts Company, Ohio (product Poly-S). NOR-AM Chemical Company (product Enspan).
- **Product:** Sulfur-coated phosphate compounds and sulfur-coated potash fertilizers.
Uses: Golf courses, lawn care, nurseries.
Suppliers: Terra International (Canada) Inc., Ontario. Pursell Industries Inc., Alabama (products TriKote, Polyon PCF). LESCO, Inc., Ohio (product Poly Plus). Cedar Chemicals Corporation (product Multicote).
- **Product:** Polymer/sulfur-coated urea.
Analysis: (38.5-40)-0-0-(11-15). Sulfur-coated urea is coated with a polymer sealant.
Characteristics: Higher nutrient efficiency, uniform release over time, ability to alter release pattern by varying polymer thickness, improved handling characteristics (less dust and breakdown). More effective polymers are made sulfur coating unnecessary for controlled release properties.
Uses: Wholesale nurseries and greenhouses, blended consumer lawn and garden fertilizers, specialty agricultural crops (e.g., strawberries).
Suppliers: Pursell Industries Inc., Alabama (products TriKote, Polyon PCU). LESCO, Inc., Ohio (product Poly Plus). The Scotts Company, Ohio (product Poly-S). Vigoro Industries Inc., Florida (product Escote). Sherritt Inc., Alberta (products Duration, ESN). Imported from Japan by Helena Chemical Co., Tennessee (product Meister).

- **Product:** Polymer-coated fertilizers
Analysis: Products range from polymer-coated single nutrient materials (e.g., urea) to custom blends of polymer-coated single nutrient and blended materials. Polymer coating accounts for 4-15% of the fertilizer, by weight.
Characteristics: Nutrient release can be controlled over a wide range of conditions by varying polymer coat thickness.
Uses: Markets include specialty agricultural crops, professional turf and commercial nurseries (and see polymer/sulfur coated urea, above).
Suppliers: Pursell Industries Inc., Alabama (product TriKote). Sherritt Inc., Alberta (products include Duration, ESN). The Scotts Company, Ohio (products ScottKote, ProKote). The Sierra Horticultural Products Co., California (products Osmocote, Sierra, Agriform, Sierrablen, High N). Imported from Japan by Plantco Inc., Ontario (product Nutricote).

5. Other Slowly Soluble Fertilizers

This category of CRFs includes compounds with limited solubility, such as metal potassium and ammonium phosphates where divalent metals (e.g., magnesium, iron, zinc, copper or manganese) and other nutrients are also slowly released. Other fertilizers in this group are spike, stake, tableted and briquette products.

- **Products:** Multi-nutrient compounds
Analysis: Various
Characteristics: Divalent metallic compounds slowly release metallic nutrients. Very controlled release of nutrients for planting, starter and container applications.
Uses: Compounds with metallic plant nutrients are used mainly in professional floriculture with potting and bedding soil mixes. Spikes and stakes are used mainly in the home and garden market with lesser applications in landscaping and nurseries and perennial fruit crops.
Suppliers: Hyponex Corporation, Georgia (product HYPONEX). The Sierra Horticultural Products Co., California (product Agriform, MagAmp). Vigoro Industries Inc., Florida (product Woodace). Weatherly Consumer Products, Kentucky (products Jobe's fertilizer spikes, Ross Gro-Stakes).

4.2 Processed Natural Organic (PNO) Fertilizers

4.2.1 Products

Processed natural organic fertilizers are expected to have lower nitrogen analyses than manufactured CRFs because of the relatively lower nitrogen content of their constituent materials, animal and vegetable waste. Nevertheless, organic materials used as PNO fertilizers and soil conditioners tend to contain significant levels of P, K, S, micro-nutrients and organic matter content. Materials used in PNO fertilizers and competing in the CRF market include vegetable and animal compost, bone meal, canola meal, cottonseed meal, dried manure, sewage sludge products, leather and garbage tankage, dried blood, feather meal, fish bone meal, fish oils, castor pomace, guano, by-product of corn processing, etc.

There is considerable variability in the degree of processing of PNO products in commercial markets. Processed organic materials may go through one or all of the various stages of processing before being used as fertilizers and/or soil conditioners.

4.2.2 Characteristics

1. Stage 1 PNO Materials

Stage 1 level of processing consists of transforming a raw organic product into a more stable nutrient material through one of the following processes: drying, anaerobic digestion, aerobic composting, hydrolysis, processing by-product. In composting, carbon amendments may be required to be added to assist the decomposition process. Absence of complete stability at this stage of processing may not be critical if the product will be used directly as a CRF product. However, the benefits of higher level processing will be compromised if the decomposition process is incomplete and the compost component is unstable in the finished products.

- **Product: Dried Animal Manures**
Analysis: Bovine (0.5-0.9)-(0.25-0.5)-(0.4-0.85)
Poultry (4.0-4.3)-(1.5-2.0)-(1.0-1.6)
Characteristics: Crumbled and screened.
Uses: Used more as conditioners rather than fertilizers.
Producers: Various
Marketing Locally: Yes
- **Product: Sewage Sludge Products**
Analysis: Composted <1% nitrogen
Sun-dried 3-5% nitrogen
Heat dried 4-7% nitrogen
Characteristics: May contain trace levels of metals. Crumbled and screened.
Uses: Not allowed on food crops in Canada. Have to meet federal standards to be used on agricultural crops in the US.
Producers: Various cities and local governments.
Marketing Locally:
- **Product: Plant Waste Composts, Crumbled and screened.**
Analysis: Low.

Characteristics: Decomposed products of leaves, straw, sawdust, etc. Typically is variability in final product.

Uses: Low nutrient soil amendment and topsoil replacer, potting soils.

Marketing Locally: Capital Regional District, Victoria.

- **Product:** Animal Waste Composts. Crumbled and screened.
Analysis: E.g., 4-4-2 composted poultry product, 1-1-1 steer manure. Varies by composition of raw products.
Characteristics: Composted manures generally contain less than one half the nitrogen of fresh manure, but in a more stable organic form. Less than 15% of total nitrogen is generally available in the year of application. Carbon source amendments to poultry manures target carbon: nitrogen ratios of 25:1. Partially stable materials, i.e. composted under 6-8 months can impart mal-odours to the finished product or burn vegetation. Too quickly composted products become sterile if beneficial soil microbes are killed along with pathogens.
Uses: As a soil conditioner and low-analysis organic fertilizer. Composted cattle manure for use in semi-arid regions is used in mine reclamations.
Producers: Stutsman Farms, Oregon, In Seasons Farms, Langley. Con Agra, Idaho.
Marketing Locally: In Season Farms, Langley. GardenWorks, Victoria.
- **Product:** Plant/Fish/Animal Waste Compost Fertilizer, Pelleted, crumbled and screened.
Analysis: 8-2-4, 5-5-5, 3-3-3.
Characteristics: The Answer Garden products are made from organic matter from retails, restaurants and hotel; residues from food processing plants: waste from fish processing plants: waste from poultry processing plants/hatcheries; small amounts of poultry manure; yard and garden organic waste.
Uses: Potting soils, soil conditioners, organic fertilizers.
Producers: Envirowaste Industries Ltd., Vancouver (Subsidiary: The Answer Garden Products Ltd., Aldergrove).
Marketing Locally: EarthGro, 1881 Select and The Answer brand names from Envirowaste Industries Ltd., Vancouver (Subsidiary: The Answer Garden Products Ltd., Aldergrove). Products sold through retailers such as Costco, Safeway, Buy-Low, garden centres.
- **Product:** Hydrolysed leather meal and copolymerized leather tankage.
Analysis: Concentrated nitrogen level.
Characteristics: Product is hydrolysed or chemically extracted from organic materials where nitrogen is not present in an available form.
Uses: Prohibited in organic farming. Mainly used as a component of blended fertilizers.
Producers: Hynite Corporation, Wisconsin (product Hynite).
Marketing Locally:
- **Product:** Liquid by-product of corn processing.
Analysis: 1-4% nitrogen
Uses: Applied to local farm pastures and cropland, free of charge.
Producers: Archer Daniels Midland, North Carolina.
Marketing Locally: None.

2. Processed Stage 1 Products

Additional processing may be undertaken to improve the physical/handling characteristics of a stage 1 product.

Dried or composted materials are pelleted or granulated to yield a fertilizer/soil conditioner of higher density, more uniform size, greater physical integrity, and more uniform nutrient and moisture content. Treatments may be required to mask or reduce odours. These products can be retail marketed alone or used as a filler in mixed fertilizer products.

- **Product:** Pelleted Poultry Manure Compost
Analysis: 3-4-3
Characteristics: Broiler litter, with pine sawdust/shavings, composted for 6-8 weeks. Crushed and screened. Product has an odour that can be controlled by proportion of carbon in the compost. Shipped at 12% moisture.
Uses: In the US southwest, 85% sold in bulk into the agricultural market (e.g., rice fields). On the US eastern seaboard, high percent of fines are used on tees and greens in the golf course market.
Producers: Dynamic Lifter, Alabama. Harmony, Virginia.
Marketing Locally: None.
- **Product:** Granulated Poultry Manure Compost
Analysis: 3-2-2
Characteristics: Turkey litter composted for 6-8 weeks. Sustane uses a pin mill to granulate product.
Uses:
Producers: Sustane, Minnesota.
Marketing Locally: Agrico, Delta.
- **Product:** Pelleted Dehydrated Poultry Litter
Analysis: 5-3-2
Characteristics: Layer manure collected at 60% moisture, dehydrated down to 7% moisture, after which it is pelleted, granulated and blended.
Uses: Sold throughout western US, through United Horticultural Products (Con Agra).
Producers: Morning Fresh Egg Farms, Colorado (Rich Lawn).
- **Product:** Pelleted Dehydrated Poultry Litter
Analysis: Guaranteed 3-1-1, but up to 3-2-2, depending on feed.
Characteristics:
Uses: >99% sold in bulk for blending in the home garden market. <1% sold directly to home market.
Producers: Virginia Dehydrating, Virginia.
Marketing Locally: None.

Additional processing may also increase/modify plant nutrient content and/or balance. Organic and/or non-organic fortifiers are blended with a stage 1 product into a homogeneous material, by granulation and pelleting processes, to boost plant nutrient analysis. These products may be retail marketed as blended fertilizers or used as fillers and mixed with manufactured CRFs. Blended PNO fertilizers offer flexibility in devising controlled release fertilizer formulations which can be tailored to the timing and needs of specific crops and also provide the soil conditioning and micro-nutrient benefits of organic matter.

Critical factors affecting the acceptability of fortified PNO fertilizers in specialty uses are the maturity of the product for plant fertilization, product integrity, clean handling characteristics, and consistency of nutrient analysis. With the increased emphasis on total analysis of products and on supplying the optimal level and timing of nutrients to specific crops, PNO products often represent the most variable component in the

- **Product:** Pelleted Digested or Composted Sludge Fortified with Manufactured Chemicals
Analysis: E.g., 3-2-0
Characteristics:
Uses:
Producers: Massachusetts Water Resources Authority. City of Milwaukee, Wisconsin (Milorganite).
Marketing Locally: Milorganite by Integrity Sales, Victoria.
- **Product:** Granulated Vegetable Compost Fortified with Manufactured Chemicals.
Analysis:
Characteristics: Fortified with urea.
Uses:
Marketing Locally: Envirowaste Industries Ltd., Vancouver (Subsidiary: The Answer Garden Products Ltd., Aldergrove).
- **Product:** Granulated Poultry Manure Compost Fortified with Organic Materials.
Analysis: (3-14)-(2-10)-(4-10)
Characteristics: Broiler or turkey litter compost fortified with hydrolysed feather meal, blood meal, cottonseed meal. Products differentiated by granule size and analysis. Harmony 14-3-6 organic-based product is 60% compost containing 60% water-insoluble nitrogen. Sustane uses a pin mill to granulate product.
Uses: Commercial turf maintainers, lawn care, home market, institutional and golf courses, specialty fruit and vegetable production markets.
Producers: Sustane, Minnesota; Harmony Products Inc., Virginia (Bridge™ products).
Marketing Locally: Sustane is marketed by Agrico, Delta and used as an organic base in turf and retail products.
- **Product:** Pelleted Dried Poultry Manure Blended with Manufactured Chemicals
Analysis: 8-8-8
Characteristics: Crumbled and screened. Organic-based fertilizer consisting of 50% fortified broiler litter compost.
Uses: Establishment of golf courses, golf course roughs, substitute for peat moss in home garden market. Processing technology developed by Tennessee Valley Authority, Alabama.
Producers: Howe Co. (Con Agra), Minnesota produced this product until recently.
Marketing Locally: None.
- **Product:** Granulated Poultry Manure Compost Fortified with Manufactured Chemicals.
Analysis: (8-18)-(2-8)-(6-8)
Characteristics: Organic-based fertilizers fortified with urea to boost nitrogen content. Some formulations contain secondary nutrients. Sustane uses a pin mill to granulate product.
Uses: Used primarily in mixed fertilizers
Producers: Sustane, Minnesota; Harmony, Virginia.
Marketed Locally: Sustane is marketed by Agrico, Delta and used as an organic base in turf and retail products.
- **Product:** Granulated Poultry Manure Compost Fortified with Organic Materials and Manufactured Chemicals.
Analysis: (10-18)-2-(6-10)
Characteristics: Small amounts of manufactured CRF and/or soluble potash are added to raise analysis of blended organic-based product. Sustane uses a pin mill to granulate product.

Uses: Institutional, landscapers and golf courses.

Producers: Sustane, Minnesota.

Marketed Locally: Sustane is marketed by Agrico, Delta.

- **Product:** Pelleted Poultry Manure Compost Fortified with Manufactured Chemicals.
Analysis: 3-6-3
Characteristics: Manure composted 6 weeks. Pelleted product is crushed and screened. Odour maskers are used.
Uses: Custom retail market (Home Depot)
Producers: Dynamic Lifter, Alabama.
Marketing Locally: None.
- **Product:** Granulated Feather Meal, Blood Meal, Bone Meal and Cottonseed Meal.
Analysis: (10-12)-2-(6-8). 100% organic materials.
Characteristics: 94% water-insoluble nitrogen.
Uses: Retail market targeted with retail packs. Commercial turf maintainers for tees and greens. Residential lawn care. Citrus aromatics and oil of wintergreen are used to mask odours.
Producers: Ringer-Safer Corporation, Minnesota.
Marketing Locally: Dawson Seeds, Cloverdale (Ringer-Safer products). Ringer-Safer sells directly into the home retail market.
- **Product:** Granulated Feather Meal, Blood Meal, Bone Meal, Cottonseed Meal Fortified with Manufactured Chemicals
Analysis: 22-0-0, organic-based.
Characteristics: Fortified with urea formaldehyde.
Uses: Professional lawn care, golf courses, consumer lawn and garden care.
Producers: Harmony Products Inc., Virginia.
Marketing Locally: Bridge™ product (EnviroBase).
- **Product:** Granulation of Co-polymerized Leather Tankage and Methylene Urea
Analysis:
Characteristics:
Uses: Turf mixes.
Supplier: Omnicology, Inc., N.Y. (product Organiform)
- **Product:** Pelleted Fish Bone Meal, Potassium Sulfate, Blood Meal, Feather Meal, Fish Oil, Crushed and screened.
Analysis: 10-3-5. Fortified version is 15-3-5 (urea added).
Characteristics: Uniformly small crumbles, very clean, little odour.
Uses: Targets fertilizer market for turf.
Producers: Bio-Grow Products Inc., Oregon.
Marketing Locally: None.
- **Product:** Canola Meal
Analysis: (5-6)-1-1
Characteristics: Product, bone meal and organic glue is pelleted, then crumbled and screened. Coast Agri markets a granulated fortified and blended canola meal-based product CAN GRO analysing 5-2-5 and 6-2-1. Product is protein-based and very low in salts, which differentiates it from other organic products.

Uses: As an organic filler in home market products.

Producers: CIC Canola Technologies Inc., Alberta.

Marketing Locally: Coast Agri, Abbotsford. Integrity Sales, Victoria.

Table 1:

US Volumes and Values of Production of Controlled Release Fertilizers, 1993.

	US value of production (1993)	US volume of production (1993)
	Percent	
Urea-Formaldehyde (UF) Reaction Products (1)	42.5 %	23.1 %
Isobutylidene Diurea (IBDU)	4.9 %	2.1 %
Crotonylidene Diurea (CDU)	neg.	neg.
Sulphur-Coated Urea and Polymer/Sulfur-Coated Urea	13.0 %	11.2 %
Polymer Coated Materials (2)	19.8 %	4.7 %
Other Slowly Soluble Products (3)	5.5 %	1.1 %
Processed Natural Organic Fertilizers	14.3 %	57.8 %
Total	\$254.8 Mill.	828,200 Tons

Notes:

(1) Includes UF Liquid Concentrates; Ureaform (solid); Methylene Ureas, NPK (solid); Methylene Ureas, 40-0-0 (solid); Cold-water soluble methylene diurea, MDU (solid); cold water-soluble dimethylene diurea, DMTU (solid); UF Suspensions (liquid); UF Solutions (liquid).

(2) These products may contain NPK materials or single nutrient materials for custom blending.

(3) Represented by several metal ammonium and potassium phosphates where the divalent metal may be magnesium, iron, zinc, copper or manganese.

5.0 CURRENT SUPPLY AND DISPOSITION: RAW POULTRY MANURE PRODUCT**5.1 Local Supply of Poultry Manure**

Approximately 140,000 tonnes of poultry manure are produced annually in the Fraser Valley as follows (1990 estimate):

Poultry Sector	% of Total	Volume ('000 tonnes)
Chicken/broiler	51%	70.8
Egg layer/breeder	22%	30.6
Turkey	21%	29.2
Broiler Hatching Egg	6%	8.3
Total	100%	138.9

Currently, local markets are absorbing virtually all volumes of poultry manure produced. Nevertheless, the raw product supply for processed natural organic fertilizers made from poultry manure is likely to be expanded as a result of the following factors:

- Expansion of the poultry industry. An increase in production of poultry manure over 1990 volumes is forecast at 163% to the year 2000, and 265% to the year 2010.
- Increased availability in the winter, when land application is not feasible.
- More stringent environmental regulation
- Ability of processors to be competitive in bidding for raw product

5.2 Disposition of Poultry Manure

Of the 140,000 tonnes of poultry manure generated in the lower Fraser Valley of BC, some 39% is currently used in raw state by farmers on their own lands. The other 61% is hauled off-farm. In summary, disposition of poultry manure in the lower Fraser Valley is as follows:

- 39% applied by poultry farmers on their own lands (54,600 tonnes)
- 20% applied off-farm on raspberry acres as fertilizer (28,000 tonnes)
- 29% applied off-farm as a general crop fertilizer (40,600 tonnes)
- 12% used as an ingredient in mushroom compost (16,800 tonnes).⁴

6.0 DEMAND FOR PROCESSED NATURAL ORGANIC (PNO) FERTILIZERS

⁴Ference-Weicker and Company. 1994. Options to Remove Poultry Manure from the Fraser Valley.

6.1 Previous Estimates of the Slow Release and PNO Fertilizer Markets

The Ference-Weicker 1994 study identified components of the total market for fertilizers/amendments, the portion potentially accessible to all types of poultry manure products, current use of processed natural organic (PNO) products and current use of poultry manure.

6.1.1 Use of Poultry Manure Products

The Ference-Weicker 1994 study figures suggest current market penetration of PNOs into slow release markets of between 6-12% of the total slow release market accessible to PNOs. Of this portion, penetration of BC poultry manure PNOs was determined to be negligible, consisting annually of an estimated 3 tonnes of composted product in the retail consumer market. This information is summarized in Table 2, below.

6.1.2 Previous Assessments of PNO Product Markets

The Ference-Weicker 1994 study focused primarily on markets for raw and composted poultry manure product. Nevertheless, the controlled release market for PNOs was identified and roughly estimated at 1500 to 3000 tonnes for BC. These opportunities were considered to be in the retail consumer market and the commercial and professional turf market segments. The volume estimate was extrapolated from PNO use in the Minnesota professional turf market.

Table 2

Summary of Market Potential for Lower Mainland Poultry Manure ('000 tonnes)

Market Segment	Total Market for Fertilizer/Soil Amendments	Market Accessible to Poultry Manure Products	Current Use of Processed Natural Organic Products	Current Use of Poultry Manure Products
Delta Farmers	90	45 (1)	0	neg. (raw)
Interior BC	275	137.5 (2)	0	neg. (raw)
Mine/Landfill/Gravel Pit Reclamation	0.5	neg. (3)	?	0
Cattle Feed	40	10 (4)	0	0
Retail Markets	25	5.5 (5)	1-2	3 (raw and composted)
Topsoil Distributors	15-30	8 (6)	0.5-1.0	neg. (raw and composted)
Field Nursery	3.6	0.35-0.5 (7)		neg.
Container Nursery	30-40	3-4 (8)		0
Landscape Contractors	?	neg. (9)		0
Sod Farms	?	6 (10)		? (raw and composted)
TOTAL	489.1-504.1	216	1.5-3.0	3

Source: Ference-Weicker and Company. 1994. Options to Remove Poultry Manure from the Fraser Valley.

Notes:

- (1) Based on current nitrogen fertilizer use equivalency divided by 2.
- (2) Based on 50% replacement of current fertilizer use and applications of cow manure.
- (3) Current market is saturated with lower cost municipal sewage and solid waste products.
- (4) Based on potential for replacement of 20% of total rations and realization of 25% of the resulting market.
- (5) Based on a comparison of population and the PNO market in Minnesota.
- (6) Based on obtaining a percentage of the market for soil conditioners such as bark, mushroom manure, steer manure, sawdust, peat moss, fish and feather meals.
- (7) Based on obtaining a 10% market share of fertilizer requirements related to ball and burlap production and cover cropping.
- (8) Based on obtaining a 10% share of the peat market on 6000 acres.
- (9) Based on obtaining 5% of the bulk top soil market for organic materials.
- (10) Based on the potential for application of 3 tons per acre on 2000 acres in the lower mainland.

7.0 CHARACTERISTICS OF THE MARKET FOR PROCESSED POULTRY MANURE PRODUCT

Previous market investigation has focused on the nutrient content of poultry manure to estimate the potential markets accessible to the PNO products. This focus has not adequately explained why significant quantities of the product have not moved into these markets, even when the acquisition cost has been close to zero and the net benefits have been considered positive. Combined with the extra handling and costs to make low level poultry manure products attractive to consumers, there has been little economic incentive to pursue options in this area.

This market investigation has re-examined the market for PNO products, ranging from "low end" to "high end" further-processed products. The products and targeted markets are diverse. The promotional stance may emphasize "organic" content, "organic-based", "fortified", or nutrient release characteristics. Of importance, non-agricultural markets are more significant consumers of controlled release and PNO products than agricultural markets.

One significant new market opportunity has not been articulated in previous studies. The "filler" market for conventional blended and mixed fertilizers is accessible to PNO products, based upon inherent advantages related to slow nutrient release, soil-amending properties, micro-nutrient content, and perceived pesticide characteristics. The entry of PNO products into the professional turf and retail markets can not be explained in terms of nutrient content, although nutrient level in PNO products can be a quality factor. Rather, transformation and improvement of the physical characteristics of poultry manure and composts by further-processing has increased their range of application and substitutability for a wider range of products.

The following sections present information on the key characteristics of products in the PNO market.

7.1 Raw Material to Plant

Table 3 presents the range of raw materials that are used to make PNO products. Different ingredients are used for various reasons including:

- Availability of raw materials
- Adjust the Carbon: Nitrogen ratio for composting.
- Boost nutrient analysis with organic or manufactured fortifiers.

Certain raw materials appear to be better suited as raw materials for PNO products. Those materials and their attributes include:

- Turkey and broiler litter have moisture and carbon characteristics which assist composting.
- Layer and breeder manures require additional carbon material for composting.
- Feather, bone, blood and fish meals contain high levels of organic N.
- Plant wastes have lower nutrient levels than animal wastes
- Cottonseed and canola meals and poultry manure act as carriers in compost mixtures.
- Presence of trace metals is characteristic of sewage sludge products and must be present in acceptably low concentrations for land application.
- Leather tankage not considered an organic source of N.

Table 3: Raw Materials Used in Processed Poultry Manure Plants

Organic Materials Used	Producers of Processed Natural Organic Fertilizers										
	Bio-Grow Turf	The Answer	TVA	Dynamic Lifter	Virginia Dehydrating	Sustane	Harmony Products	Ringer	Hynite	Milorganite	CAN GRO
Layer Manure				X							
Breeder Manure				X							
Broiler Litter		X	X	X	X		X				
Turkey Litter					X	X					
Animal Processing Waste		X									
Plant Waste		X	X	X							
Feather Meal	X					X	X	X			
Bone Meal								X			
Blood Meal	X						X	X			
Cottonseed/Canola Meal								X			X
Processed Sewage Sludge										X	
Leather Tankage									X		
Fish Oil	X										
Fish Processing Waste	X	X									
Unprocessed Natural Minerals	X										
Treatment*	C,P	C,P	C,P	C,P	D,P	C,G	C,G	G	S	C,P	G

* C = Composted, D = Dried, G = Granulated, P = Pelleted, S = Hydrolysed, X = Raw Materials Used.

7.2 Controlled Release Additives

An emphasis in the development of controlled release fertilizers (CRFs) has been on improving the efficiency of nitrogen use by producers. Nitrogen, as a major plant nutrient, commands the largest share of the fertilizer market and can be subject to large losses before uptake by plants.

Markets for other slowly soluble fertilizers also exist, particularly in specialty crops, professional turf and commercial nursery sectors. The market for total analysis fertilizer products with controlled release characteristics matched to plant needs is growing.

Table 4
Product Forms of PNO Fertilizers in the Industry

Controlled Release Components	Used with Composts in:	
	Processed Blends	Mixes (Bulk Blends)
Organic Fertilizers	X	
Urea-Form (UF)		X
Methylene Urea		X
Sulfur Coated Urea (SCU)		X
Polymer Coated Urea (PCU)		X
Zeolite	Tried, by Ringer	
Enzymatic Additives		
Other slow release fertilizers		

7.3 Product Odours

Consensus: A definite problem if not controlled at some stage of the process. Need to differentiate between organic smell, partially composted smell, and foul smells related to mould, rot, etc.

Options:

- Lengthen composting period
- Use zeolite, etc.
- Use masking agents such as oil of wintergreen, citrus aromatics, banana deodorant
- Add more carbon in the composting stage
- Moisture control @ 2-3%

Experiences:

- Zeolite tried - difficult to work with, abrasive to equipment since have to be added in processing stage
- Odour a problem in mixing with other fertilizer materials
- Have to watch that organic fertilizers do not get wet in handling
- Longer composting period not economical

Perceptions:

- Odours are a disadvantage in the home retail and institutional markets
- Odours may be an advantage in home gardener market.
- Organic smell on golf courses not a problem if members know why
- Most important is "absence of mal-odour"

7.4 Product Form and Analysis

7.4.1 Terminology

Chemical blend processed natural organic (PNO) fertilizers - organic materials mixed with compost then further-processed into granulated or pelleted products. Objectives: Increase N content while maintaining 100% organic content.

Chemical blend organic-based fertilizer - chemical materials are mixed with compost, then further processed into granulated or pelleted products. Objectives: Increase N content in an organic-based fertilizer (at least 15% organic material).

Mixed (bulk) blended organic fertilizers - organic fertilizers are mixed with a granulated or pelleted compost or blended PNO product.

Mixed (bulk-blended) organic-based fertilizers - chemical fertilizers are mixed with a granulated or pelleted compost or blended PNO product. Objective: To produce a fertilizer with highly specific release characteristics matched to the requirements of specific crops, and containing organic components.

Consensus:

The physical quality of the granulated/pelleted product is critical to its acceptance as a fertilizer source. To be used as a fertilizer, the product must be capable of being applied with precision, durable, unadulterated, and possess guaranteed analyses of plant nutrients. To be used as a component or ingredient of a mixed fertilizer, a compost-based PNO product must, in addition, lend itself to mixing without segregation or breakdown.

Table 5

Desirable Attributes of Fertilizer Blend and Mix Components

Characteristics	Desirable Chemical Blend Component Attributes	Desirable Mixed Blend Component Attributes	Concerns
Non-abrasive	X		Equip. Life
Non-corrosive	X	X	Equip. Life
Homogeneity	X	X	Reliable analysis
Particle Integrity	X	X	Handling Mixing
Bulk Density		X	Segregation
Particle Shape and Size	x	X	Consistency Handling Application Differentiation
Particle Hardness	x	X	Disintegration Virtual Absence of Dust
Moisture Content	X	X	Resistance to wetting Breakdown Storability
State of Compost	X	X	Phyto-toxicity Pathogen-free Weed-free Absence of mal-odours

X = Major concern, x = Minor concern.

7.4.2 Product Analysis

As seen in the two Tables below, compost does not match the balance or analysis of products preferred in the turf, golf course and home lawn markets. Additives to boost nutrient analyses in organic compost-based fertilizers generally focus on higher N and K values. Organic benefits are becoming recognized but at this time, claims are not scientifically defensible.

Organic nitrogen fortifiers are all controlled release ingredients and the fertilizer can contain extremely high levels of cold water insoluble nitrogen (e.g., Ringer products contain up to 94% CWIN). If the compost component of the fertilizer is stable and mature, these products are completely safe for any application.

Organic-based, chemically fortified fertilizers possess higher N content than organic, organically fortified fertilizers. Addition of water soluble nitrogen ingredients to compost-based organic fertilizers sometimes occurs but represents a convenient, but relatively higher cost nitrogen source than, for example, urea. More commonly, chemical fortifiers are usually controlled release fertilizers themselves and their proportions are determined in relation to the timing of the feeding requirements of the plants being fertilized.

The market for organic product is small and unorganized. Among organic growers, the distribution system is virtually non-existent and the quantities demanded are small and irregular. At the home retail level, the average user is not willing to pay more for organic quality. The conventional farmer discriminates among fertilizers only on the basis of price.

Table 6
Typical Nutrient Analyses of Fertilizers used in Selected Market Segments

Market Segment	Preferred Analysis
Turf	(5-12)-(2-4)-(3-10)
Golf Courses/Sports Fields	
Home Lawn	

Table 7
Typical Nutrient Analyses of PNO Product Forms

Product Form	Analysis
Compost	1-7-? to 3-4-3
Blended Organic, Organically Fortified	(10-12)-(2-10)-(4-10) 40 - 60% compost
Blended Organic-Based, Chemically Fortified	E.g., 18-2-6 15 - 60% compost

Table 8**Potential Markets by Product Packaging**

Market	Bulk	Mini-Bulk	Large Bag	Small Bag, Boxed
Conventional Farm	X			
Organic	X			
Horticultural	X		X	
Institutional			X	
Home Garden	X	X	X	X

Table 9

Product Form and BC Prices by Destination Market

Destination Market	Organic Product Form	Competitive Pricing
Conventional Farm	Raw Manure/Litter	Cost of Pickup/Application
Organic Farm	Raw Manure/Litter Organic Fertilizers s.a. bone/blood meal	Cost of Pickup/Application \$846/tonne (retail)
Horticultural	Raw Manure/Litter Mushroom Manure Composted Material Granulated Chemically Fortified Organic-Based Product	Cost of Pickup/Application \$110/tonne (retail bulk) \$54 - 89 (retail bulk) \$300 -350 (retail bulk)
Institutional	Granulated Chemically Fortified Organic-Based Product Fine granule High N Controlled Release Properties Milorganite	0.27 - 0.60 per lb. (retail bagged) 0.40 per lb. (retail bagged)
Home Garden	Bagged Composted Manure Potting Soils Milorganite (Processed Sewage Sludge) Pelleted Composted Poultry Product Granulated, Fortified Organic Product	0.05 - 0.21 per lb. (retail) 0.22 - 0.31 0.40 0.13 - 0.15 0.40 - 0.61
Wholesale Filler	Limestone Pelleted Composted Organic Product Pelleted Chemically Fortified Organic-Based Product Milorganite Sustane (5-2-4) CAN GRO	\$50-60/tonne (wholesale bulk) \$100 (wholesale bulk) \$150 (wholesale bulk) \$363 (wholesale bulk) approx. \$500 (wholesale bulk) \$350 (wholesale bulk)

7.5 Quality Control

Producers and users of processed natural organic fertilizers indicate quality control factors in the following categories:

A. Composting

- Absence of mal-odour
- No phyto-toxicity
- Pathogen free
- Weed free
- Stability of the final product

B. Fertilizer Characteristics

- Granular integrity/hardness
- Known nutrient levels
- Consistency of size and shape
- Known pH, bulk density, soluble salt content, water holding capacity.

C. Evidence of Quality Control

- Size differentiation
- Virtual absence of dust
- Guaranteed analysis
- Low moisture levels
- Public relations and product support
- Research on how their products will respond in intended applications

D. Potential Quality Enhancers

- Organic matter content
- Trace elements/micro-nutrients
- Identification/documentation of disease, insect and fungal control by compost use
- Scientific evidence of benefits of increased microbial activity in the soil
- Scientific evidence of beneficial effect of organic and organic-based fertilizers on crop yields and plant growth
- Research on economic benefits of organic and organic-based nutrient feeding of plants
- Research on the use of processed natural organic products as horticultural substrates
- Determine the effect of compost on irrigation requirements
- Determine optimal compost application rates for specific crops
- Determine optimal re-application rates for specific crops.

Nutrient characteristics of the raw material change as a function of poultry diet. Changes in the proportions of manure, litter and other carbon sources in the composting materials may be required.

Effective quality control during composting to control odours, kill pathogens and preserve beneficial microbes in a mature product increases the quality and homogeneity of the processed product. A poorly composted product can be a sink for nitrogen as well as potentially harmful to plants (i.e., "burn" effects). Most composters exercise quality control in the selection of raw materials.

While PNOs have controlled release characteristics, the popularity of organic materials has suffered from their low N content and the high rates required to meet application rates. However, the trend toward total analysis fertilizers geared to specific plant requirements has emphasized the need for different controlled release substances and balanced nutrient applications. In these situations, high quality processed natural organic fertilizers can provide soil conditioning and

performance enhancing effects in addition to their nutrient content and non-leaching characteristics.

In order to gain market share as an ingredient in an high-end controlled release fertilizer, a PNO fertilizer ingredient must perform as well as a manufactured CRF ingredient and cost less or offer enhanced performance. Confidence in the performance characteristics of a PNO product stems from consistency and quality control in the processing. Undesirable physical attributes of PNO materials remain one of the major factors restricting the use of PNOs in mixed controlled release fertilizers.

7.6 Markets

Investigations were conducted into several market segments to ascertain demand for controlled release fertilizers (CRFs), use of processed natural organic (PNOs) products and potential demand for composted pelleted poultry manure product. The market was broken into the following market segments:

- Conventional Farms
- Organic Farms
- Horticultural (landscapers, nurseries, ornamentals, greenhouse)
- Market Gardening
- Home Garden
- Chain Stores
- Potential New Markets

7.6.1 Conventional Farms

There is no significant developed potential for the use of processed natural organic products on conventional farms in B.C. Commercial farmers currently use significant quantities of raw manures obtained at minimal prices or for the cost of trucking.

Use of PNOs in the US agricultural crop sector represented about 42% of total PNO use in 1993. Of the 42%, 68% consisted of corn processing waste (Archer Daniels Midland) that was directly applied free of charge on farmers' fields in proximity to the plant. Processed sewage sludge accounted for the majority of the other PNOs applied in the agricultural sector, primarily on citrus, vegetables, melons and strawberries in Florida.

Niche agricultural markets can be important considerations for PNO consumption. Eighty-five percent (85%) of the production of composted pelleted poultry manure product at one Alabama plant is bulk-marketed to the rice sector in the southern US.

Longer term potential exists for the increased use of controlled release fertilizers on agricultural specialty crops, related to concerns about nutrient leaching and environmental pollution. Nevertheless, conventional farmers continue to discriminate among fertilizers primarily on the basis of unit price for major nutrients supplied.

7.6.2 Organic Farms

The BC organic farming sector is estimated to comprise less than 500 acres in total. Besides being a small market for PNOs, organic fertilizers are generally too high priced to favour a significant repeat clientele.

Field trials in the Wenatchee, WA area have indicated the beneficial aspects of high quality composted organic materials in fruit tree production and yields. PNOs (composts) are also being applied by conventional growers to new plantings in old orchards.

7.6.3 Horticultural Market

This market segment is defined to include landscapers, field and container nurseries, ornamentals and greenhouses. The potential market for PNOs in this market segment is considered significant, although the actual current use of PNOs is relatively low. Results are summarized in Table .

Landscapers:

The landscape market consists of bulk and bagged purchases. The actual market share is difficult to differentiate from the home/garden retail market due to the significant purchase of volume discounted materials from home garden centres. Purchases consist primarily of composts and soil conditioners, although small volumes of high end PNOs (such as Harmony products) are also sold.

The BC landscaper demand for fertilizers is estimated at 500-1000 tonnes, annually, of which 150-300 tonnes may be accessible to processes natural organic products.

Field and Container Nurseries:

Nursery acreage in the Lower Mainland is estimated at 6000 acres. This acreage is broken down to approximately 5000 acres field nursery (including Christmas trees) and 1000 acres container nursery.

Field nursery production typically occurs over a 3-4 year cycle with a 1 to 1.5 year intervening fallow period to replenish the land for new planting. Primary crops include woody shrubs and trees, a significant proportion of which are sold into the landscaping and retail markets. The industry is a significant user of raw poultry and cattle manures in the preparation phase of the cycle, acquired for the cost of hauling and application. Applications of manufactured chemical fertilizers of 200-250 lb./year are typical, consisting of about 60-70 lbs. N, annually. Slow release fertilizers are an important source of nutrients in the industry with sulfur coated urea (SCU) estimated to supply approximately 7% of the nitrogen requirements.

The container nursery sector uses a variety of controlled release fertilizers, including processed organic products, peat moss, and polymer coated urea (PCU). Typically, plants are grown out over a two year period. Assuming an N content of 25% for the PCU used (e.g. Nutricote, Osmocote), an annual average of approximately 0.96 tonne of actual PCU product may be used per acre.

The potential market for a composted, pelleted poultry manure product in the field and container nursery sector is considered significant. However, raw manure is perfectly suited to the soil rebuilding and conditioning purposes for which it is used in field nurseries. Until raw material is unavailable, PNOs will not command a price sufficient to provide a return in this market.

Second, container growth mediums require precision fertilizers with predictable behaviour in controlled environments. While PNO producers of Sustane, Harmony and Ringer are funding research efforts to clarify the effect of PNOs on plant growth, the requirements of many plants are unknown. The elevated salt content of processed poultry manure products

can be a disadvantage.

Third, "high end" processed organic materials currently on the market have not penetrated this market segment.

Nevertheless, the quantities of filler material used in the sector (see Table 10) and the sophistication of fertilizer practices should be noted. Horticultural practices are trending toward the increased use of higher end controlled release products. As such, a high quality, competitively-priced, composted poultry manure product with suitable physical characteristics has significant potential to create a market share in this sector, particularly as a filler in fertilizer bulk blends.

Ornamentals and Greenhouse

This market segment consists of cut flowers, vegetables and potted plants. In BC, plant feeding is overwhelmingly either by hydroponic or drip irrigation system. While in-ground systems may have some demand for manure and sawdust in alternate plantings for soil amendments purposes, both of these systems rely on soluble fertilizers as the source of plant nutrients.

The potential for composted pelleted chicken manure product in this sector is not considered significant.

7.6.4 Institutional Market Segment

This market segment is defined to include playing fields, parks, schools, golf courses and cemeteries. Overall, the volume of sales in the public sector of this market is stagnant to declining, because of a cutback in funds to maintain public areas. There are 137 18-hole golf courses in the province and numerous par 3's, representing an estimated 7000 acres and combined fertilizer use of approximately 1000 tonnes per year. Cemeteries represent an additional ? acres of groomed turf in the province.

The fertilization requirements vary from maintenance of special turfs in high traffic areas (such as sports fields, golf tees and greens) to economical long term quality lawn care. Desirable fertilization characteristics include:

- controlled release of nutrients over prolonged periods to promote steady growth
- products suited to rehabilitating problem areas
- reduced leaching/loss of nutrients

PNOs have beneficial characteristics in this market segment related to microbial content, perceived pesticide properties and soil conditioning. "High end" PNOs used by the institutional sector include Sustane, Ringer and CAN GRO products with analyses in the range 5-(2-4)-(3-5). These PNOs are considered expensive, accounting for about 15% of the filler market. Key quality factors are particle size, no phyto-toxicity, significant nutrient content and absence of mal-odours.

The institutional market for fertilizer is estimated at 5,000 tonnes, annually, of which about 20% is currently accessible to processed natural organic CRFs. Currently, some 10-15% of the filler market is serviced by "high end PNOs.

A composted, fortified, pelleted poultry compost product of local origin and nutrient analysis comparable to the "high end" PNO products currently available could make an impact on the institutional market segment.

7.6.5 Home/Garden Retail Market Segment

Major Lower Mainland fertilizer dealers and distributors were asked their views about controlled release fertilizer use

in the home/garden retail market segment. As shown in Table 10, the BC home/garden retail market is estimated at between 10,000 and 12,000 tonnes, annually, with about 200 tonnes entering BC from the US and Alberta. Fillers represent 25-30% of the total tonnage, or perhaps 3000 tonnes, of which 75-90% is represented by limestone and the remaining 10-25% by "high end" organic products.

The market potential for a composted pelleted poultry manure product in the home/garden retail market segment is considered significant. Primarily, a low analysis (2-2-2) composted, pelleted poultry manure product is seen to be positioned for entry as a "low end" organic filler in home/garden retail fertilizers. The prime destination for this product would be in bulk supply to fertilizer mixers/distributors, replacing limestone in the fertilizer mix.

Fortification of the PNO pellet for use as a filler may be feasible, depending on the demand for controlled release products containing organic materials. Thus, while this market may be considered currently accessible at "net-back" prices to the producer in the range of \$100-150/tonne, there may be potential for a higher value product commanding "net-back" prices in the range of \$200-250/tonne in the future.

Secondarily, there is a potential market for a composted, fortified, pelleted poultry manure product bagged directly for the home/garden retail market. This PNO product would compete directly with bagged soil conditioners (composts) and low analysis fertilizers. The market is extremely price sensitive but accessible to a composted, fortified, pelleted poultry manure product with superior analysis (e.g., 4-2-3) and good handling characteristics. The Answer Garden, Aldergrove currently markets plant/animal composted products of different analyses in this market segment through chain stores in BC and the Pacific Northwest, including Costco, Safeway, Buy-Low and garden centres. The products are marketed as soil conditioners, potting soils and organic fertilizers.

7.6.6 Vegetable Market Gardeners

This market segment, consisting of vegetable market gardeners, is identifiable mostly as a unique end user for the same types of fertilizer products sold in the home/garden retail segment. Industry sources estimate the size of this market to be approximately 10% of the size of the home garden market for filler (i.e., in the range of 300 tonnes). Operators may purchase their requirements from both blenders and garden centres. Market gardeners tend to be more knowledgeable about plant nutrition and fertility requirements than the average home/garden centre retail customer, extremely value conscious in their purchasing characteristic and cautious with new products.

As such, an organic or organic-based product with superior nutritional characteristics and competitively value-priced could be expected to appeal to this market segment, although not without the support of extensive research. However, the market gardener profile ranges from conventional to organic in production orientation and operators are not likely to react homogeneously to "organic" fertilizer product characteristics.

7.6.7 Mine and Landfill Reclamation

This potential market for pelleted compost poultry manure products was briefly examined and confirmed the findings of an earlier study⁵. It is concluded that there is no significant market for the product under discussion. First, the quantity of fertilizer/soil conditioner used is small. Second, a pelleted product would have to compete with municipal sewage sludges and solid waste composts which are currently priced and applied to these sites as a waste disposal option. Third, where manure based products are used, raw poultry manure is cheaper and equally effective for reclamation purposes.

⁵ See Ference Weicker & Co. 1995. Options to Remove Poultry Manure from the Fraser Valley, pp. 34-38.

Table 10

Estimated Markets for Processed Natural Organic Products and Fillers By Market Segment, B.C., 1995

Market Segment	Acres	Fertilizer Tonnage	Filler Market	CRF Use	Current PNO Market	Potential PCCPM Market (75% of Filler Market) (1)	Potential PCCPM Market (100% of Filler Market) (2)
		Tonnes					
Total Conventional Farm		?	?	neg.	neg.	?	?
Fraser Valley & V.I.							
Field Veg & Berries	33,000	5860	1760	neg.	neg.	?	?
Field Crops	122,000						
Tree Fruits	1,820						
Organic Farm	500	neg.	neg.	neg.	neg.	neg.	?
Total Horticultural	?	?	1,120-1,270	> 984-996	15-30	825-900	1,100-1,200
Landscapers	?	500-1,000	150-300	> 15-30	15-30	75-150	150-300
Field Nursery	5,000	570	170	9 SCU	0	?	?
Container Nurseries	1,000	?	800	960 PCUs	0	?	?
Ornamentals/Greenhouses	400	100	0	0	0	0	0
Total Institutional	?	4,200-5,800	1,260-1740	> 500	500	1125	1500
Golf Courses	7,000	1,000-1,500					
Parks/Schools		700-1,000					
Cemeteries		2,500-3,300					
BC Home/Garden Retail (including Vegetable Market Gardeners)	n/a	10-12,000	3,000-3,600	> 600	600 CAN- GRO, Sewage Sludge, Sustanc	2400	3300
Totals			7,140-8,370	2100	1,115-1,130	4400	5900

Notes: (1) Refer to discussions in Section 7.6 for rationale in selecting estimates. These figures are based on capturing 75% of the filler market deemed accessible to PNO products in the home/garden retail, vegetable market gardener, and institutional market segments.

(2) Refer to discussions in Section 7.6. Figures in this column are based on capturing 100% of the filler market for PNO products in the home/garden retail, vegetable market gardener, and institutional market segments.

7.7 Price Indicators

Price and cost estimates presented in Table 11 were obtained through industry contacts. These values should be used with caution and as indicators only for the following reasons:

- Actual prices/costs vary as a function of custom specifications, volumes purchased, delivery arrangements, payment terms and promotional pricing in place at any point in time.
- FOB plant prices are indicated for plants spread throughout North America and may significantly affect delivered prices to BC.
- US dollars have been converted to \$ Canadian at a rate of 1.41:1.
- Prices/costs may fluctuate significantly within the year.

7.8 Price Sensitivity

Table 12 presents the pricing range of poultry compost products in the bulk market. Essentially, products are considerably improved in their handling characteristics by pelleting. As an organic product, pelleted composted poultry manure is estimated to fall into a \$100/tonne pricing category, in comparison to an average wholesale price of \$50/tonne for composted manure soil conditioners.

A fortified pelleted composted poultry manure product is anticipated to be extremely competitive in the organic-based filler market at approximately \$150/tonne. This pricing schedule would undercut further processed manure products in the existing filler market as well as allow the fortified product to compete with limestone fillers, on the basis of its nutrient content.

Table 13 estimates the market penetration of a new pelleted composted poultry manure product at various ex-plant price levels in the fertilizer filler market. At a price competitive with limestone (\$50/tonne), the pelleted composted product is anticipated to capture up to 75% (2250 tonnes) of the filler market within 2 years. At \$100/tonne, the pelleted product could potentially expand into 50% of the market for filler materials within 2.5 years. At \$300/tonne, market penetration is estimated to be about 10% after 5 years and representing about 300 tonnes of the current B.C. filler market considered accessible to the product.

Table 11
Estimated Current Prices in the Bulk Fertilizer Markets

Bulk Product	Wholesale		Commercial	
	\$/Ton	\$/Tonne	\$/Ton	\$/Tonne
Urea 46-0-0	209-230*	230-254*	380*	419*
UreaForm (UF) 38-0-0	804-839**	886-925**		
UF Suspensions 18-0-0	324**	357*		
UF Solutions 30-0-0	501-599**	552-660**		
Urea-Triazone 28-0-0	698**	769**		
IBDU	1199**	1321**		
SCU 37-0-0-16	402-458** ¹ , 472*	443-505** ¹ , 520*	590*	650*
PCU 38-0-0	639*	700*	817-1252*	900-1380*
PSCU (38.5-40)-0-0-(11-15)			672*	740*
Methylene 40-0-0	839-1021**	925-1125**	1308**	1441*
Field Nursery Blends			318-327*	350-360*
Container Nursery Blends			363*	400*
Pelleted Sewage Sludge (4.5-6% N)	63-121** ¹ , 68*	70-134** ¹ , 75*		
Fortified Sludge Pellet 6-0-2	248** ¹ , 363*	273** ¹ , 400*		
Limestone	45-54*	50-60*		
Pelleted canola meal 5-1-1	318*	350*		
Feathermeal	353-494*	389-544*		
Statenan, Oregon Composted Poultry Manure 4-2-2			182*	200*
Dried Poultry Waste, Washington			282*	310*
Partial Compost 1% N Guaranteed, Washington			85*	99*
Bloodmeal 15-0-0			846	932
Ringer 50 Lb Bags (5-18)-(2-10)-(5-10)			1008-1216	1111-1340
Sustane 50 Lb Bags 12-8-8			1200	1322
Sustane 50 Lb Bags (5-3)-2-(2-4)		500*	840	926
Bio-Grow Turf 10-3-5			719*	792*
Harmony Pelleted Composted Poultry Manure Products	204-261**			
Bridge™ Envirobase 22-0-0	388**	427**	536	590
Pelleted Composted Poultry Manure Products 3-4-3	169-190**	186-209**	204-261	224-288
Hynite (11-12% N)	213**	235**		
Pelleted Dehydrated Poultry Litter 3-1-1	141-197**	155-217**		
Composted Poultry Manure 2-2-2	49-56**	54-62**		
Mushroom Manure			100*	110*
CAN GRO 5-2-5	318*	350*		

* = Delivered. ** = FOB plant

Table 12

Competitive Pricing for Poultry Compost Products Entering the Bulk Market

Bulk Product	Wholesale	Commercial
	\$/Tonne	
Standard Compost Manures	45-50	90-100
Pelleted Composted Organic Based Products	100	165-220
Organic-Based N-P-K Agricultural Mixes		331
Fortified Composted Poultry Manure Pellet (4-1-2,4-2-3)	150	300-400

Table 13

Estimated Price Sensitivity of the Market Potential for Pelleted Composted Poultry Manure in the BC Home and Garden Filler Market

Price (\$Can./Tonne)	Market Share (%)	Volume (Tonnes/Year)	Years to Achieve
\$50	75%	2250	2.1
\$100	50%	1500	2.4
\$150	30%	900	2.9
\$200	20%	600	3.5
\$250	13%	400	4.1
\$300	10%	300	5.0
\$350	7%	200	5.0
\$400	5%	150	7.2

SECTION A: NOMENCLATURE**A.1 Fertilizers and Supplements**

The Fertilizers Act of Canada defines a fertilizer as "... any substance or mixture of substances containing nitrogen, phosphorus, potassium or other plant food, manufactured, sold or represented for use as a plant nutrient".

A supplement is defined as "... any substance or mixture of substances, other than fertilizer, manufactured, sold or represented for use in the improvement of the physical condition of soils or to aid plant growth or crop yields", including pre-inoculated seeds and coated pre-inoculated seeds. Claims about supplements commonly refer to the activity of a product containing nutrients, but not associated with its nutritional value.

Several classes of animal and/or vegetable organic matter compositions are designated as single ingredient fertilizers/supplements in Schedule II of the Fertilizers Act.

A.2 Organic Matter

Organic matter is defined in the Fertilizers Act as "... that substance of animal or vegetable origin remaining after the removal of the moisture and total ash fractions". Only products that are solely derived from organic matter may be identified or described as "organic". The Act distinguishes the following fertilizers and supplements derived from organic matter:

Blood Meal	Collected blood of slaughtered animals, dried and ground containing not less than 12% nitrogen (grade to be specified).
Compost, Humus, Leaf Mould	Homogeneous and friable mixtures of partly decomposed organic matter with or without earth.
Fish Meal or Fish Scrap	Fish tissue, bone and waste heated under live steam, dried and ground (grade to be specified).
Garbage Tankage	The rendered, dried, ground and screened organic product derived from waste household food materials (grade to be specified).
Hoof and Horn Meal	Processed, dried, ground hoofs and horns, ground to a fineness of at least 40% through a sieve having openings that are square and are each 0.149 mm (100 mesh TYLER screen) in width (grade to be specified).
Manure	Dried and ground excreta of animals or birds with or without litter, containing not less than 50% organic matter, and designated as to kind and condition (grade to be specified).
Paunch Manure	Slaughter house refuse and offal mixed with straw or other organic absorbent, not containing less than 60% organic matter (grade to be specified).
Composted Manure	The product resulting from humification of the organic matter fraction of the excreta of animals or birds with or without litter (grade to be specified).
Peat	Partly decayed vegetable matter of natural occurrence accumulated in water.
Processed Sewage	Products made from sewage freed from grit and coarse solids that are dried, ground and screened (grade to be specified).
Tankage	The rendered, dried and ground product from animal tissue and residue (grade to be specified).
Bone Meal	Animal bones that are treated under live steam and are dried and ground to a fineness of at least 40% through a sieve having openings that are square and are

each).149 mm (100 mesh TYLER screen) in width (grade to be specified).

The Association of American Plant Food Control Officials (AAPFCO), which since 1948 has made recommendations relating to the control of sale and distribution of mixed fertilizers and fertilizer materials, defines organic fertilizers as materials "... containing carbon and one or more elements other than hydrogen and oxygen essential for plant growth". In organic materials, nitrogen is combined with carbon, hydrogen, oxygen and other elements in complex compounds which must decompose in the soil before nitrogen is available to plants.

A.3 Natural Organic Fertilizers

There is no designation of natural organic fertilizers in the Fertilizers Act of Canada. Many of the Schedule II fertilizers and supplements manufactured from organic matter are found in this class.

The AAPFCO defines natural organic fertilizer as "... materials derived from either plant or animal products containing one or more elements (other than carbon, hydrogen, and oxygen) which are essential for plant growth. These materials may be subjected to biological degradation processes under normal conditions of aging, rainfall, sun-curing, air drying, composting, rotting, enzymatic, or anaerobic/aerobic bacterial action, or any combination of these. These materials shall not be mixed with synthetic materials or changed in any physical or chemical manner from their initial state except by physical manipulations such as drying, cooking, chopping, grinding, shredding or pelleting".

A.4 Processed Natural Organic Fertilizers

U.S. fertilizer literature may also make reference to "processed natural organic fertilizers". This class of fertilizers includes dried blood, castor pomace, compost (composted plant material and sawdust), cottonseed meal, dried manure, activated and other processed sewage sludge, tankage and other organic materials which are by-products of animal or vegetable substances. Although application of raw manure on croplands is a major use of animal manures, only that portion which is collected, dried and sold as fertilizers is included in the class of processed natural organic fertilizers. The effect of processing is to concentrate the nutrient content of the organic end product from generally less than 5% nitrogen in the raw product to greater than 5% nitrogen in the processed product, often by fortification with chemicals.

A.5 Certified Organic Fertilizers and Soil Amendments

The B.C. Organic Agricultural Products Certification Regulations of the Food Choice and Disclosure Act require "certified organic" designation of soil amendments, fertilizers and growth promoters in the production of "B.C. Certified Organic" food products. B.C. organic crop production standards are similar to those in most U.S. states and Canadian provinces. Sewage sludge and septage and raw manures contaminated with prohibited substances are prohibited under the regulations. Use of composted organic waste material derived from on-farm animal manures is allowed, but if purchased off-farm, must be accompanied by written documentation as to source and declared free of prohibited substances. Processed natural organic fertilizers, fortified with chemicals to increase their N-P-K analyses are not acceptable inputs for certified organic production.

Urea reaction products, which represent the base material for the bulk of controlled release products, are organic nitrogen compounds albeit synthetically produced. Nonetheless, controlled release fertilizers based on urea reaction products (see below) are prohibited as a source of nitrogen in the production of certified organic products. The use of elemental sulfur is discouraged and subject to regulation.

Sources of plant nutrients which are considered organic include the following:

Nitrogen:

- Green manures
- Nitrogen fixing crops
- Composted organic materials
- Blood meal
- Vegetable meal
- Hoof and horn meal
- Fish meal and fish emulsion

Phosphorus:

- Colloidal, soft rock and hard rock phosphate
- Bone meal

Potassium/Calcium:

- Dolomitic lime
- Agricultural limestone
- Ground oyster shells
- Rock phosphates
- Agricultural gypsum (calcium sulfate), mined forms only
- Eggshell meal
- Bone meal
- Composted organic materials

Sulfur/Magnesium:

- Langbeinite (sulphate of potash magnesia)
- Potassium sulphate, mined materials only
- Kieserite, Epsom salts (hydrated magnesium sulphate)
- Elemental sulfur (regulated)

Micronutrients:

- Liquid or powdered seaweed extract
- Kelp meal
- Worm castings
- Rock powders
- Chelated minerals, if chelating agent is from a natural source
- Sulphates of zinc or iron (regulated)
- Ulexite, colemanite, borax (regulated)

A.6 Organically-Based Fertilizers

The Canadian definition of an "organically-based" fertilizer is a product which contains at least 15% natural organic matter. The analysis must carry a guarantee for the minimum amount of organic matter (Trade Memorandum T-4-106).

A.7 Slow Release Fertilizers

Fertilizers designated as "slow release" fertilizers have delayed nutrient release characteristics in the soil. These fertilizers are represented by manufactured products, processed natural organic products and mixtures (blends) of each. The research and commercial development of manufactured slow release fertilizers has focused on nitrogen release characteristics because of the higher potential for nitrogen to be lost in fertilizer applications than other major nutrients and because of the relatively larger tonnages of nitrogen consumed. Slow release fertilizers are defined in terms of their nitrogen release characteristics.

Nutrient release is delayed in slow release fertilizers in the following ways:

- Nitrogen is contained in compounds which have low water solubility
- Soluble nitrogen is physically protected by coating encapsulation
- Products are mixed with materials which restrict access to soluble nutrients
- Combinations of the above.

A.8 Controlled Release Fertilizers

Under the Canadian Fertilizers Act, a product represented on the label to perform as a controlled release fertilizer, other than slow release mixed fertilizers consisting of Isobtylidene (IBDU), urea formaldehyde, urea-form or any other compound having slow release properties, must also have a report on field performance tests to back up claims (s. 10.3(2)).

The AAPFLO uses the terms 'slow release' and 'controlled release' interchangeably to describe fertilizers which contain slowly released plant nutrients and no fertilizer label shall bear a statement that connotes or implies that certain plant nutrients contained in a fertilizer are released slowly over time, unless the nutrient or nutrients are identified and guaranteed. The terms "water insoluble", "coated slow release", "slow release", "controlled release", "slowly available water soluble" and "occluded slow release" are considered to apply to the same class of fertilizers. All fertilizers described by the terms, above, must be supported by a testing program acceptable to the AAPFLO for evaluating the release characteristics of the products.

Fertilizers which are recognized as products with slow release properties are:

- Water insoluble (N products only), such as natural organic materials, ureaform materials, urea-formaldehyde products, IBDU, oxamide, etc.
- Coated slow release, such as sulfur coated urea and other encapsulated soluble fertilizers
- Occluded slow release, where fertilizers or fertilizer materials are mixed with waxes, resins, or other inert materials and formed into particles
- Products containing water soluble nitrogen such as ureaform materials, urea-formaldehyde product, methylenediurea (MDU), dimethylenetriurea (DMTU), dicyanodiamide (DCD), etc.
- Organic nitrogen products where the water insoluble nitrogen guarantee must not be less than 60% of the nitrogen in organic form equivalent to X% N present in the fertilizer.

The AAPFLO definition of a slow or controlled release fertilizer is as follows:

"A fertilizer containing a plant nutrient in a form which delays its availability for plant uptake and use after application, or which extends its availability to the plant significantly longer than a reference 'rapidly available nutrient fertilizer' such as ammonium nitrate or urea, ammonium phosphate, or potassium chloride. Such delay

of initial availability or extended time of continued availability may occur by a variety of mechanisms. These include controlled water solubility of the material (by semipermeable coatings, occlusion, or by inherent water insolubility of polymers, natural nitrogenous organic material, protein materials or other chemical forms) by slow hydrolysis of water soluble low molecular weight compounds, or by other unknown means".

Those fertilizers where the slowly released nutrient is less than 15% of the guarantee for total nitrogen (N), phosphoric acid (P_2O_5) or soluble potash (K_2O), as appropriate, cannot bear reference to slow release designations.

A.9 Slowly Available Water Soluble Nitrogen

This AAPFLO definition refers to water soluble nitrogen in insoluble slowly available form. These constituents are to be differentiated from water soluble nitrogen and are contained in ureaform fertilizer materials and urea-formaldehyde products which may be described as "sparingly soluble".

SECTION B: FERTILIZER REGULATION AND CONTROL

B.1 Canadian Fertilizer Regulation

The Minister of Agriculture and Agri-Food Canada is responsible for the administration of the Fertilizers Act, the legislation for the regulation and control of agricultural fertilizers in Canada. Composts and processed sewage are within the purview of the Act and must meet specific criteria and standards for safety and efficacy. The regulations deal with requirements in the following areas:

- Need for registration
- Fertilizer content standards
- Guaranteed analysis and tolerances
- Labelling
- Units of measurement
- Testing requirements.

Canadian Ministry of Agriculture chemists, toxicologists and other scientists are represented in the Association of American Plant Food Control Officials (AAPFCO), a group consisting of federal, provincial, dominion and state experts which is formed to make fertilizer terminology more uniform and to make regulatory recommendations. Canadian regulators support the terminology and standards developed by that organization.

Issues relating to composted organic fertilizers are currently being jointly addressed at the federal level by the Standards Council of Canada, Canadian Committee of Ministries of the Environment and the Department of Agriculture. The objective is to develop quantitative specifications and standards for compost relating to pathogens, minerals, stability, organic and inert contaminants. These criteria will become a voluntary national CSA standard, requested by industry to ensure that only high quality products are placed on the market.

Agriculture Canada, Food Production and Inspection Branch, has prepared Trade Memoranda to assist in the interpretation of the Fertilizers Act and Regulations. Two of these documents pertain to organic products and processed sewage and by products⁶. Trade Memorandum T-4-93 lists maximum acceptable metal concentrations in processed sewage, sewage-based products and other by-products⁷ with a total nitrogen content of 5% or less represented for sale as fertilizers or supplements. Trade Memorandum T-4-106 provides a further interpretation of organic fertilizers as defined under the Fertilizers Act.

B.1.1 Requirement for Registration

Only 5-10% of the fertilizers and supplements put up for review under the Fertilizers Act are actually registered. A significant aspect of enforcement of the regulations is to ensure that product labelling is related to the proper representation of the product on the label.

⁶Trade Memorandum T-4-93. April 26, 1991. Metal concentrations in processed sewage and by products. Trade Memorandum T-4-106. April 10, 1991. Organic fertilizers under the Fertilizers Act.

⁷These include, but are not limited to composted manure, municipal waste tankage, garbage tankage, leather tankage, industrial sewage.

Soil amendment products and supplements, such as super-absorbents, soil wetting agents, inoculants and micro-nutrient fertilizers, tend to require registration. If fertilizers contain pest control chemicals or representations (including anti-fungal properties), they are not considered fertilizers or supplements and the products must meet the requirements of the Pest Control Products Act.

Schedule II of the regulations lists those products exempt from registration under the Fertilizer Act. This list includes unmixed fertilizer and supplement compounds and products containing specific grades of compounds containing nitrogen, available phosphoric acid and soluble potash, including inorganic sources of nitrogen, such as urea, urea-formaldehyde, urea-form and Isobutylidene.

Schedule II fertilizers or supplements in the same organic class as processed poultry manure products are also exempted from registration under the Fertilizers Act (may require grade labelling in terms of its percentage content of total nitrogen, available phosphoric acid and soluble potash) and include the following:

Compost, Humus, Leaf Mould	Homogeneous and friable mixtures of partly decomposed organic matter with or without earth.
Manure	Dried and ground excreta of animals or birds with or without litter, containing not less than 50 % organic matter, and designated as to kind and condition (grade to be specified).
Composted Manure	The product resulting from humification of the organic matter fraction of the excreta of animals or birds with or without litter (grade to be specified).

Peat, peat moss, sphagnum moss, tree bark and other fibrous organic matter that is represented for use only in improving the physical conditions of the soil are also exempt from the requirement for registration under the Act.

Fertilizers and supplements composed of organic matter in the form of animal or vegetable manures in their natural condition, represented accurately and not generally detrimental to vegetation, domestic animals or public health, are generally exempted from the requirements of the Act altogether.

B.1.2 Fertilizer Content Standards

The N-P-K analysis of Schedule II unmixed fertilizer compounds is largely determined by the manufacturing process and/or the chemical composition of the source materials. Mixed fertilizers containing nitrogen, phosphorus or potassium must have a total content of not less than 24% of the major plant nutrients combined, with the exception of (s. 10(1)):

- Customer-formula fertilizers (prepared for specific customers)
- Specialty fertilizers (i.e., recommended for use on household plants, urban gardens, lawns, golf courses and nurseries, in greenhouses, or as a source of lesser plant nutrients only)
- Mixed fertilizers containing ingredients of at least 50 % animal or vegetable origin, supplying 25 % of the nitrogen in the mixture in a water-insoluble form and consisting of at least 18 % major plant nutrients combined.

Under the Canadian Fertilizers Act, a mixed fertilizer that is represented as a slow release fertilizer (i.e., consisting of Isobutylidene diurea (IBDU), urea formaldehyde, urea-form or any other chemical compound with slow release properties) shall contain at least 25 % of the total nitrogen guaranteed present in the water-insoluble form (s. 10.3(1)). If controlled release performance characteristics are claimed, such representations must be backed up with field performance tests of

the product.

Any claims not related to nutritional characteristics of a product must be substantiated with statistically significant efficacy data from Canadian field trials. Such a product is likely to be considered a supplement under the Fertilizers Act and require registration.

Before a compost or processed sewage product can be offered for sale in Canada, the fertilizer/supplement must be evaluated by Agriculture and Agri-Food Canada to determine whether it meets the requirements of the Fertilizer Act and Regulations. Information requirements include manufacturing process, source materials, analyses, product label or shipping bill (if sold in bulk).

B.1.3 Guaranteed Analysis

Every fertilizer represented as a source of plant nutrients must contain a minimum amount of total nitrogen, available phosphorus and soluble potash (major nutrients). If lesser plant nutrients are identified, they must be guaranteed in at least minimum concentrations, as set out in Trade Memorandum T-4-106. Schedule I of the Fertilizers Act indicates maximum allowable variances about the guaranteed analysis for each nutrient.

Mixed fertilizers containing at least 25% of their nitrogen in water-insoluble form of plant or animal origin or other source of slowly available nitrogen, must have the minimum guaranteed analysis of water-insoluble nitrogen expressed in percent.

Those fertilizers and supplements containing manure, compost, humus or leaf mould must report the minimum amount of organic matter expressed in percent and the maximum amount of moisture expressed in percent (s. 15(m)). If the compost is claimed to provide nutrients, a grade and guarantee for the nutrients are required.

B.1.4 Labelling

Fertilizer labelling must reflect the grade of the fertilizer in the total mixture, guaranteed analysis, weight and other descriptive information about the product.

A label statement implying the presence of a slowly available plant nutrient in a product is not allowed unless 25% of the guaranteed amount of the nutrient is present in a water soluble or other slowly available form (s. 17).

Only products containing at 25% of a nutrient in a slowly available form may indicate that the nutrient can be described as having "low leaching potential".

In order to suggest that the use of an organic or organic based product will "improve the structure of a soil", it must be recommended for use at rates that could be expected to significantly increase the organic matter of the soil.

B.2 US Fertilizer Regulation

At the national level, fertilizer products are regulated under the provisions of the US Fertilizer Act. For historical reasons, state fertilizer laws and regulations vary substantially, with implications for inter-state and international movements of products. Particular problems faced by manufacturers of processed natural organic products have included differences in nutrient content requirements and variation tolerances by state.

While the terminology and standards advocated by the AAPFCO are considered to represent ideals, all states have adopted

at least some of the recommendations in their fertilizer regulations. The AAPFCO recommends regulatory provisions in the control of sale and distribution of mixed fertilizers and fertilizer materials. There is a strong orientation towards "truth in labelling", full analysis and description of characteristics of plant nutrients contained within products, and testing to substantiate claims.

In 1994, The Composting Council and the Florida Department of Agriculture and Consumer Services commissioned a study of "Suggested Compost Parameters and Compost Use Guidelines" to compare potential physical demand for compost with the potential production of compost in the US. The report is a "state of the art" compilation of summary information and expert opinions on qualitative and quantitative parameters for specific compost applications and markets. The data presented is proposed as interim standards for process control until formal standards are developed in the industry.

APPENDIX II

**RETAIL PRICE ESTIMATES OF HYPOTHETICAL FERTILIZER BLENDS
CONTAINING PELLETED AND CRUMBLED, COMPOSTED POULTRY MANURE IN
THE HOME AND GARDEN RETAIL MARKET**

APPENDIX II

RETAIL PRICE ESTIMATES OF FERTILIZER FORMULATIONS CONTAINING PELLETED AND CRUMBLED, COMPOSTED POULTRY MANURE AT DIFFERENT COST LEVELS

II.1 INTRODUCTION

The purpose of Appendix II is to illustrate the effect on the per unit prices for N-P-K plant nutrients of using PCCPM as a filler in blended fertilizer formulations. Variations in per unit N-P-K prices are examined as a function of varying the price of PCCPM between \$50 and \$200 per tonne, using two analysis of PCCPM, and changing the analysis of the blended end product from 6-8-6 to 25-3-7. Fertilizer pricing using limestone or canola meal as fillers in blended fertilizers is presented in the last Table to compare the price competitiveness of blended PCCPM fertilizers on a N-P-K basis.

In general, Appendix II can be used to establish the approximate retail cost of blended fertilizers with PCCPM fillers for a range of N-P-K analysis fertilizers commonly used in the market segments in which a potential market for PCCPM fillers has been identified. Our brief survey of garden centres (results not presented here) suggests that, assuming a "trouble -free" quality standard for PCCPM product, the prices indicated for hypothetical fertilizer products containing PCCPM, below, are competitive with products currently sold in the home/garden retail market segment.

II.2 FINDINGS

This Appendix contains retail price estimates, at Home Garden Centres, for three hypothetical fertilizer blends containing pelleted and crumbled, composted poultry manure (PCCPM) as an organic filler. Those estimates are summarized in the table below. The data has been developed using four different PCCPM cost levels and two different PCCPM analyses.

The PCCPM (referred to as PCM in the following tables) has been blended with normal urea, polymer-coated urea (PCU), mono-ammonium phosphate (MAP), and potash to produce the specified N-P-K analyses. The proportions of normal urea and polymer-coated urea have been adjusted into the two higher analysis products to result in specific amounts of slow release and quick release nitrogen. The lower analysis product does not contain any PCU.

The retail cost estimate data developed in Appendix II is presented in three different formats, all

based on 20 kg. bags. In the summary table below, the data is presented only in terms of Canadian dollars per 20 kg. bag. In the Appendix Tables following, the price estimates are also presented in dollars per tonne and in term of dollars per pound of nitrogen. In the latter case, for the sake of simplicity, all of the value of the fertilizer has been assigned to nitrogen and the P and K contents have been ignored.

Summary Table

Estimated Retail Price For Selected Fertilizer Blends Containing Pelleted and Crumbled, Composted Poultry Manure (PCCPM).

Analysis	PCCPM Analysis A (2-4-2)			PCCPM Analysis B (5-4-4)		
	(6-8-6)	(18-6-12)	(25-3-7)	(6-8-6)	(18-6-12)	(25-3-7)
PCCPM Cost (\$ Per Tonne)	Dollars Canadian Per 20 Kg. Bag					
\$50	8.08	18.58	23.05	7.28	17.83	22.43
\$100	9.6	19.24	23.6	8.99	18.59	23.06
\$150	11.2	19.91	24.12	10.7	19.34	23.69
\$200	12.63	20.57	24.72	12.41	20.1	24.32

Included in Appendix II is one lower range product (6-8-6) based on using limestone, at \$40/tonne as a filler material, and one higher range product (25-3-7) based on canola residue as a filler material, at \$350/tonne. Because the limestone has no nutrient value, the limestone-based formulation requires increased use of the higher analysis chemical fertilizer additives. Interpolating the data developed in this Appendix shows that PCCPM at \$78/tonne is competitive with limestone at \$40/tonne for the lower PCCPM analysis. At \$50/tonne for limestone, the higher analysis PCCPM is competitive at \$106/tonne. Because of its higher cost, the canola residue-based formulation is more expensive than any of the hypothetical PCCPM-based products.

Also indicated by the data in the Appendix II tables is the fact that the nutrient cost to the consumer is lower for the higher analysis products.

LOW END PRODUCT - (6-8-6) A

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	50	2%	4%	2%	75.76	1.52	3.03	1.52	37.88	5.24	0.76	6.00	Raw Mat'l	109.62	2.19	
Urea	305	46%	0%	0%	7.50	3.45	0.00	0.00	22.88				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	0.00	0.00	0.00	0.00	0.00				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	9.38	1.03	4.97	0.00	38.93				Del. to Dealer	189.62	3.79	
Potash	135	0%	0%	61%	7.36	0.00	0.00	4.49	9.94				Dealer Markup	189.62	3.79	
Total					100.00	6.00%	8.00%	6.00%	109.62				Selling Price	404.24	8.08	3.06

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	100	2%	4%	2%	75.76	1.52	3.03	1.52	75.76	5.24	0.76	6.00	Raw Mat'l	147.50	2.95	
Urea	305	46%	0%	0%	7.50	3.45	0.00	0.00	22.88				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	0.00	0.00	0.00	0.00	0.00				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	9.38	1.03	4.97	0.00	38.93				Del. to Dealer	227.50	4.55	
Potash	135	0%	0%	61%	7.36	0.00	0.00	4.49	9.94				Dealer Markup	227.50	4.55	
Total					100.00	6.00%	8.00%	6.00%	147.50				Selling Price	480.00	9.60	3.63

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	150	2%	4%	2%	75.76	1.52	3.03	1.52	113.64	5.24	0.76	6.00	Raw Mat'l	185.38	3.71	
Urea	305	46%	0%	0%	7.50	3.45	0.00	0.00	22.88				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	0.00	0.00	0.00	0.00	0.00				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	9.38	1.03	4.97	0.00	38.93				Del. to Dealer	265.38	5.31	
Potash	135	0%	0%	61%	7.36	0.00	0.00	4.49	9.94				Dealer Markup	265.38	5.31	
Total					100.00	6.00%	8.00%	6.00%	185.38				Selling Price	555.76	11.12	4.20

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	200	2%	4%	2%	75.76	1.52	3.03	1.52	151.52	5.24	0.76	6.00	Raw Mat'l	223.26	4.47	
Urea	305	46%	0%	0%	7.50	3.45	0.00	0.00	22.88				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	0.00	0.00	0.00	0.00	0.00				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	9.38	1.03	4.97	0.00	38.93				Del. to Dealer	303.26	6.07	
Potash	135	0%	0%	61%	7.36	0.00	0.00	4.49	9.94				Dealer Markup	303.26	6.07	
Total					100.00	6.00%	8.00%	6.00%	223.26				Selling Price	631.52	12.63	4.78

MEDIUM RANGE PRODUCT - (18-6-12) A

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	50	2%	4%	2%	33.21	0.66	1.33	0.66	16.61	6.00	12.00	18.00	Raw Mat'l	371.99	7.44	
Urea	305	46%	0%	0%	10.22	4.70	0.00	0.00	31.17				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	29.17	11.67	0.00	0.00	262.53				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.82	0.97	4.67	0.00	36.60				Del. to Dealer	451.99	9.04	
Potash	135	0%	0%	61%	18.58	0.00	0.00	11.33	25.08				Dealer Markup	451.99	9.04	
Total					100.00	18.00%	6.00%	12.00%	371.99				Selling Price	928.98	18.58	2.34

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	100	2%	4%	2%	33.21	0.66	1.33	0.66	33.21	6.00	12.00	18.00	Raw Mat'l	388.60	7.77	
Urea	305	46%	0%	0%	10.22	4.70	0.00	0.00	31.17				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	29.17	11.67	0.00	0.00	262.53				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.82	0.97	4.67	0.00	36.60				Del. to Dealer	468.60	9.37	
Potash	135	0%	0%	61%	18.58	0.00	0.00	11.33	25.08				Dealer Markup	468.60	9.37	
Total					100.00	18.00%	6.00%	12.00%	388.60				Selling Price	962.19	19.24	2.42

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	150	2%	4%	2%	33.21	0.66	1.33	0.66	49.82	6.00	12.00	18.00	Raw Mat'l	405.20	8.10	
Urea	305	46%	0%	0%	10.22	4.70	0.00	0.00	31.17				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	29.17	11.67	0.00	0.00	262.53				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.82	0.97	4.67	0.00	36.60				Del. to Dealer	485.20	9.70	
Potash	135	0%	0%	61%	18.58	0.00	0.00	11.33	25.08				Dealer Markup	485.20	9.70	
Total					100.00	18.00%	6.00%	12.00%	405.20				Selling Price	995.40	19.91	2.51

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	200	2%	4%	2%	33.21	0.66	1.33	0.66	66.42	6.00	12.00	18.00	Raw Mat'l	421.81	8.44	
Urea	305	46%	0%	0%	10.22	4.70	0.00	0.00	31.17				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	29.17	11.67	0.00	0.00	262.53				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.82	0.97	4.67	0.00	36.60				Del. to Dealer	501.81	10.04	
Potash	135	0%	0%	61%	18.58	0.00	0.00	11.33	25.08				Dealer Markup	501.81	10.04	
Total					100.00	18.00%	6.00%	12.00%	421.81				Selling Price	1028.61	20.57	2.59

UPPER END RANGE - (25-3-7) A

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	50	2%	4%	2%	27.80	0.56	1.11	0.56	13.90	7.00	18.00	25.00	Raw Mat'l	483.71	9.67	
Urea	305	46%	0%	0%	13.75	6.33	0.00	0.00	41.94				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	44.31	17.72	0.00	0.00	398.79				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	3.57	0.39	1.89	0.00	14.82				Del. to Dealer	563.71	11.27	
Potash	135	0%	0%	61%	10.57	0.00	0.00	6.45	14.27				Dealer Markup	563.71	11.27	
Total					100.00	25.00%	3.00%	7.00%	483.71				Selling Price	1152.43	23.05	2.09

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	100	2%	4%	2%	27.80	0.56	1.11	0.56	27.80	7.00	18.00	25.00	Raw Mat'l	497.61	9.95	
Urea	305	46%	0%	0%	13.75	6.33	0.00	0.00	41.94				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	44.31	17.72	0.00	0.00	398.79				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	3.57	0.39	1.89	0.00	14.82				Del. to Dealer	577.61	11.55	
Potash	135	0%	0%	61%	10.57	0.00	0.00	6.45	14.27				Dealer Markup	577.61	11.55	
Total					100.00	25.00%	3.00%	7.00%	497.61				Selling Price	1180.23	23.60	2.14

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	150	2%	4%	2%	27.80	0.56	1.11	0.56	41.70	7.00	18.00	25.00	Raw Mat'l	511.51	10.23	
Urea	305	46%	0%	0%	13.75	6.33	0.00	0.00	41.94				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	44.31	17.72	0.00	0.00	398.79				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	3.57	0.39	1.89	0.00	14.82				Del. to Dealer	591.51	11.83	
Potash	135	0%	0%	61%	10.57	0.00	0.00	6.45	14.27				Dealer Markup	591.51	11.83	
Total					100.00	25.00%	3.00%	7.00%	511.51				Selling Price	1208.03	24.16	2.19

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	200	2%	4%	2%	27.80	0.56	1.11	0.56	55.60	7.00	18.00	25.00	Raw Mat'l	525.41	10.51	
Urea	305	46%	0%	0%	13.75	6.33	0.00	0.00	41.94				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	44.31	17.72	0.00	0.00	398.79				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	3.57	0.39	1.89	0.00	14.82				Del. to Dealer	605.41	12.11	
Potash	135	0%	0%	61%	10.57	0.00	0.00	6.45	14.27				Dealer Markup	605.41	12.11	
Total					100.00	25.00%	3.00%	7.00%	525.41				Selling Price	1235.83	24.72	2.24

LOW END PRODUCT - (6-8-6) B

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	50	5%	4%	4%	85.42	4.27	3.42	3.42	42.71	3.87	2.14	6.00	Raw Mat'l	89.50	1.79	
Urea	305	46%	0%	0%	1.70	0.78	0.00	0.00	5.19				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	0.00	0.00	0.00	0.00	0.00				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.65	0.95	4.58	0.00	35.90				Del. to Dealer	169.50	3.39	
Potash	135	0%	0%	61%	4.23	0.00	0.00	2.58	5.71				Dealer Markup	169.50	3.39	
Total					100.00	6.00%	8.00%	6.00%	89.50				Selling Price	364.01	7.28	2.75

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	100	5%	4%	4%	85.42	4.27	3.42	3.42	85.42	3.87	2.14	6.00	Raw Mat'l	132.21	2.64	
Urea	305	46%	0%	0%	1.70	0.78	0.00	0.00	5.19				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	0.00	0.00	0.00	0.00	0.00				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.65	0.95	4.58	0.00	35.90				Del. to Dealer	212.21	4.24	
Potash	135	0%	0%	61%	4.23	0.00	0.00	2.58	5.71				Dealer Markup	212.21	4.24	
Total					100.00	6.00%	8.00%	6.00%	132.21				Selling Price	449.43	8.99	3.40

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	150	5%	4%	4%	85.42	4.27	3.42	3.42	128.13	3.87	2.14	6.00	Raw Mat'l	174.92	3.50	
Urea	305	46%	0%	0%	1.70	0.78	0.00	0.00	5.19				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	0.00	0.00	0.00	0.00	0.00				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.65	0.95	4.58	0.00	35.90				Del. to Dealer	254.92	5.10	
Potash	135	0%	0%	61%	4.23	0.00	0.00	2.58	5.71				Dealer Markup	254.92	5.10	
Total					100.00	6.00%	8.00%	6.00%	174.92				Selling Price	534.85	10.70	4.04

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	200	5%	4%	4%	85.42	4.27	3.42	3.42	170.84	3.87	2.14	6.00	Raw Mat'l	217.63	4.35	
Urea	305	46%	0%	0%	1.70	0.78	0.00	0.00	5.19				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	0.00	0.00	0.00	0.00	0.00				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.65	0.95	4.58	0.00	35.90				Del. to Dealer	297.63	5.95	
Potash	135	0%	0%	61%	4.23	0.00	0.00	2.58	5.71				Dealer Markup	297.63	5.95	
Total					100.00	6.00%	8.00%	6.00%	217.63				Selling Price	620.27	12.41	4.69

MEDIUM RANGE PRODUCT - (18-6-12) B

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	50	5%	4%	4%	37.73	1.89	1.51	1.51	18.87	6.00	12.00	18.00	Raw Mat'l	353.32	7.07	
Urea	305	46%	0%	0%	8.96	4.12	0.00	0.00	27.33				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	27.64	11.06	0.00	0.00	248.76				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.47	0.93	4.49	0.00	35.15				Del. to Dealer	433.32	8.67	
Potash	135	0%	0%	61%	17.20	0.00	0.00	10.49	23.22				Dealer Markup	433.32	8.67	
Total					100.00	18.00%	6.00%	12.00%	353.32				Selling Price	891.65	17.83	2.25

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	100	5%	4%	4%	37.73	1.89	1.51	1.51	37.73	6.00	12.00	18.00	Raw Mat'l	372.19	7.44	
Urea	305	46%	0%	0%	8.96	4.12	0.00	0.00	27.33				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	27.64	11.06	0.00	0.00	248.76				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.47	0.93	4.49	0.00	35.15				Del. to Dealer	452.19	9.04	
Potash	135	0%	0%	61%	17.20	0.00	0.00	10.49	23.22				Dealer Markup	452.19	9.04	
Total					100.00	18.00%	6.00%	12.00%	372.19				Selling Price	929.38	18.59	2.34

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	150	5%	4%	4%	37.73	1.89	1.51	1.51	56.60	6.00	12.00	18.00	Raw Mat'l	391.05	7.82	
Urea	305	46%	0%	0%	8.96	4.12	0.00	0.00	27.33				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	27.64	11.06	0.00	0.00	248.76				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.47	0.93	4.49	0.00	35.15				Del. to Dealer	471.05	9.42	
Potash	135	0%	0%	61%	17.20	0.00	0.00	10.49	23.22				Dealer Markup	471.05	9.42	
Total					100.00	18.00%	6.00%	12.00%	391.05				Selling Price	967.11	19.34	2.44

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
PCM	200	5%	4%	4%	37.73	1.89	1.51	1.51	75.46	6.00	12.00	18.00	Raw Mat'l	409.92	8.20	
Urea	305	46%	0%	0%	8.96	4.12	0.00	0.00	27.33				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	27.64	11.06	0.00	0.00	248.76				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	8.47	0.93	4.49	0.00	35.15				Del. to Dealer	489.92	9.80	
Potash	135	0%	0%	61%	17.20	0.00	0.00	10.49	23.22				Dealer Markup	489.92	9.80	
Total					100.00	18.00%	6.00%	12.00%	409.92				Selling Price	1004.84	20.10	2.53

UPPER END RANGE - (25-3-7) B

UPPER END RANGE - (25-5-1) B

													\$/Tonne \$/20 KG \$/lb N		
	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N			
PCM	50	5%	4%	4%	31.57	1.58	1.26	1.26	15.79	7.00	18.00	25.00	Raw Mat'l	468.15	9.36
Urea	305	46%	0%	0%	12.72	5.85	0.00	0.00	38.80				Blend,Bag, OH	55.00	1.10
PCU	900	40%	0%	0%	43.03	17.21	0.00	0.00	387.27				Transportation	25.00	0.50
MAP	415	11%	53%	0%	3.28	0.36	1.74	0.00	13.61				Del. to Dealer	548.15	10.96
Potash	135	0%	0%	61%	9.40	0.00	0.00	5.73	12.69				Dealer Markup	548.15	10.96
Total					100.00	25.00%	3.00%	7.00%	468.15				Selling Price	1121.31	22.43 2.03

													\$/Tonne \$/20 KG \$/lb N		
	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N			
PCM	100	5%	4%	4%	31.57	1.58	1.26	1.26	31.57	7.00	18.00	25.00	Raw Mat'l	483.94	9.68
Urea	305	46%	0%	0%	12.72	5.85	0.00	0.00	38.80				Blend,Bag, OH	55.00	1.10
PCU	900	40%	0%	0%	43.03	17.21	0.00	0.00	387.27				Transportation	25.00	0.50
MAP	415	11%	53%	0%	3.28	0.36	1.74	0.00	13.61				Del. to Dealer	563.94	11.28
Potash	135	0%	0%	61%	9.40	0.00	0.00	5.73	12.69				Dealer Markup	563.94	11.28
Total					100.00	25.00%	3.00%	7.00%	483.94				Selling Price	1152.88	23.06 2.09

													\$/Tonne \$/20 KG \$/lb N		
	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N			
PCM	150	5%	4%	4%	31.57	1.58	1.26	1.26	47.36	7.00	18.00	25.00	Raw Mat'l	499.72	9.99
Urea	305	46%	0%	0%	12.72	5.85	0.00	0.00	38.80				Blend,Bag, OH	55.00	1.10
PCU	900	40%	0%	0%	43.03	17.21	0.00	0.00	387.27				Transportation	25.00	0.50
MAP	415	11%	53%	0%	3.28	0.36	1.74	0.00	13.61				Del. to Dealer	579.72	11.59
Potash	135	0%	0%	61%	9.40	0.00	0.00	5.73	12.69				Dealer Markup	579.72	11.59
Total					100.00	25.00%	3.00%	7.00%	499.72				Selling Price	1184.45	23.69 2.15

													\$/Tonne \$/20 KG \$/lb N		
	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N			
PCM	200	5%	4%	4%	31.57	1.58	1.26	1.26	63.14	7.00	18.00	25.00	Raw Mat'l	515.51	10.31
Urea	305	46%	0%	0%	12.72	5.85	0.00	0.00	38.80				Blend,Bag, OH	55.00	1.10
PCU	900	40%	0%	0%	43.03	17.21	0.00	0.00	387.27				Transportation	25.00	0.50
MAP	415	11%	53%	0%	3.28	0.36	1.74	0.00	13.61				Del. to Dealer	595.51	11.91
Potash	135	0%	0%	61%	9.40	0.00	0.00	5.73	12.69				Dealer Markup	595.51	11.91
Total					100.00	25.00%	3.00%	7.00%	515.51				Selling Price	1216.02	24.32 2.21

LOW END PRODUCT - (6-8-6) Limestone Filler

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
Limestone	40	0%	0%	0%	65.62	0.00	0.00	0.00	26.25	6.00	0.00	6.00	Raw Mat'l	130.99	2.62	
Urea	305	46%	0%	0%	9.44	4.34	0.00	0.00	28.79				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	0.00	0.00	0.00	0.00	0.00				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	15.10	1.66	8.00	0.00	62.67				Del. to Dealer	210.99	4.22	
Potash	135	0%	0%	61%	9.84	0.00	0.00	6.00	13.28				Dealer Markup	210.99	4.22	
Total					100.00	6.00%	8.00%	6.00%	130.99				Selling Price	446.98	8.94	3.38

UPPER END RANGE - (25-3-7) Canola Filler

	\$/Tonne	N	P	K	Share (%)	N	P	K	\$/Tonne	Qwik N	Slow N	Total N		\$/Tonne	\$/20 KG	\$/lb N
Canola	350	5%	1%	1%	28.15	1.41	0.28	0.28	98.52	7.00	18.00	25.00	Raw Mat'l	561.91	11.24	
Urea	305	46%	0%	0%	12.45	5.73	0.00	0.00	37.97				Blend,Bag, OH	55.00	1.10	
PCU	900	40%	0%	0%	43.25	17.30	0.00	0.00	389.25				Transportation	25.00	0.50	
MAP	415	11%	53%	0%	5.13	0.56	2.72	0.00	21.29				Del. to Dealer	641.91	12.84	
Potash	135	0%	0%	61%	11.02	0.00	0.00	6.72	14.88				Dealer Markup	641.91	12.84	
Total					100.00	25.00%	3.00%	7.00%	561.91				Selling Price	1308.83	26.18	2.37

APPENDIX III
LIST OF CONTACTS

APPENDIX III

LIST OF CONTACTS

1. AgAccess. Davis, California.
2. Agrico Sales Ltd. Victoria, BC Mr. Stephen Eng.
3. Agrico Sales Ltd. Delta, BC Mr. Dave Gingrich, Vice President and General Manager.
4. Agriculture and Agri-Food Canada. Agassiz Research Station. Animal Waste Mgmt. Agassiz, BC. Dr. John Paul.
5. Agriculture and Agri-Food Canada. Summerland Research Station. Mr. Gerry Neilson.
6. Agriculture and Agri-Food Canada. Plant Industry Directorate. Ottawa. Ms. Suzanne Fortin.
7. Amsterdam Greenhouse and Garden Centre. Pitt Meadows, BC. Ms. Liddy Koch.
8. Aircomp Engineering. Aldergrove, BC. Mr. Horst Romani.
9. Art Knapp's Plantland. 4391 George Highway. Surrey, BC.
10. Association of American Plant Food Control Officials. Raleigh, North Carolina. Mr. Joel Padmore.
11. Bio Gro Products. Astoria, Oregon. Mr. Russ Farmer.
12. Borden Mercantile. Borden Street. Victoria, BC.
13. BC Golf Association. Vancouver, BC.
14. BC Nursery Trades Association. Cloverdale, BC.
15. BCMAFF. Cloverdale, BC. Mr. Jim Alcock.
16. BCMAFF. Abbotsford, BC. Mr. Geoff Hughes-Games.
17. BCMAFF. Abbotsford, BC. Ms. Christine Koch, Greenhouse Industry Specialist.
18. BCMAFF. Abbotsford, BC. Ms. Hanna Mathers, Nursery Industry Specialist.
19. BCMAFF. Abbotsford, BC. Mr. Stewart Paulson, Poultry Specialist.
20. BCMAFF. Abbotsford, BC. Mr. Dave Sands.
21. BCMAFF. Victoria, BC. Ms. Gunta Vitins, Food Industry Branch.
22. Buckerfields. Keating Cross Road. Victoria, BC.
23. Burnaby Parks and Recreation. Burnaby, BC. Horticultural Dept. Mr. Darrell Burney, Mr. Ken Smibert.
24. Burnaby Engineering Department. Burnaby, BC. Mr. Ralph Bishoff.
25. Canadian Tire. Island Highway. Victoria, BC.
26. Cannor Nurseries Ltd. Chilliwack, BC. Mr. John Mathies.
27. Cannor Nurseries Ltd. Elk Lake Drive. Victoria, BC.
28. Cedar Hill Golf Club. Victoria, BC. Mr. Keith Barwick, Superintendent.
29. CIC Canola Industries Canada, Inc. Nisku, Alberta. Mr Alex Gnutel.
30. Coast-Agri Farm and Hardware Supply. Abbotsford, BC Mr. Stan Loewen.
31. Dawson Seed Co. Cloverdale, BC Mr. Syd Pickerell.

32. Dynamic Lifter. Danville, Alabama. Mr. Robert Clark.
33. Elk Lake Garden Centre. Pat Bay Highway. Victoria, BC
34. Esquimalt Parks and Recreation. Victoria, BC Mr. Jack Boutilier, Manager.
35. GardenWorks. Blenkinsop Road. Victoria, BC
36. Green Drop Lawn Care. Calgary, Alberta. Mr. John Robinson.
37. Green Valley Fertilizer. Abbotsford, BC Mr. Chuck Mouritzen.
38. Harmony Products Inc. Chesapeake, Virginia. Mr. Mark Mucun.
39. Howe Co. (Division of Con Agra), Minneapolis, Minnesota. Dr. Paul Kreske.
40. Integrated Fertility Management. Wenatchee, WA. Mr. Phil Unterschultz.
41. Integrity Sales and Distributors. Victoria, BC Mr. Dwight Pennell.
42. International Fertilizer Development Center (IFDC), Muscle Shoals, Alabama.
43. Koco Garden Centre. 16th Avenue. Surrey, BC
44. Massachusetts Dept. of Food and Agriculture. Mr. Tim Alacata, Composting Specialist.
45. Morning Fresh Egg Farms. Denver Colorado. Mr. Mike Hoops.
46. National Composting Council. Washington, DC Mr. Randy Monk, Director.
47. National Gardening Association. Burlington, Vermont. Mr. Bruce Butterfield.
48. Ocean Park Nurseryland. 128th Street. Surrey, BC
49. Professional Lawn Care Association. Mr. Tom Delaney.
50. Ringer Fertilizer Co., Eden Prairie, Minnesota. Mr. Scott Boutelier.
51. Rodale Press Inc. Emmaus, Pennsylvania. Mr. Bob Martin.
52. Saanich Parks and Recreation. Saanich, BC Mr. Ron Carter, Supervisor, Horticultural Operations. Mr. Mike Lesku, Supervisor, Fields.
53. Statistics Canada. International Trade Division. Ottawa. Ms. Jocelyn Elibani.
54. Statistics Canada. Vancouver, BC Mr. Francois Page.
55. Stutsman Farms. Cambie, Oregon. Mr. Doug Stutsman.
56. Sustane Corporation. Cannon Falls, Minnesota. Mr. Craig Holden, President.
57. Tennessee Valley Authority. Muscle Shoals, Alabama. Mr. George Jones.
58. The Answer Garden, Aldergrove, BC Mr. Richard Chase, President.
59. The Fertilizer Institute. Washington, DC
60. The Home Depot. King George Highway. Surrey, BC
61. Triple Tree Nurseryland. Maple Ridge, BC Mr. Tom Vanderpauw.
62. USDA Agricultural Research Service. Raleigh, North Carolina. Dr. Charles Safley.
63. Vancouver Parks Board. Vancouver, BC Mr. Ron Caswell, Supervisor, Grounds Maintenance.
64. University of British Columbia. Plant Science Dept. Pacific Turfgrass Research Program. Mr. Brian Holl.
65. Van Vloten Nurseries Ltd. Pitt Meadows, BC Mr. Eelco De Zwaan, Production Manager.
66. Virginia Dehydrating Inc. Harrisburg, Virginia. Mrs. Bill Long.
67. Washington State Department of Agriculture. Organic program. Mr. Tim Batiste.

- 68. West Virginia University. College of Agriculture and Forestry. Dr. Alan Collins
- 69. Western Canada Fertilizer Association. Mr. Don McLean.
- 70. Van Isle Bricklok and Landscape Supplies. Van Isle Way. Victoria, BC
- 71. Xenios Dutch Growers. Pitt Meadows, BC Mr. Arnold Dreef.