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High ash fraction meat meal and its potential role as a fertiliser in the organic industry COPR.006

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SUMMARY

1. The under use of fertilisers is a looming problem on many large organic farming properties with grain, pasture or even horticultural production. The organic sector has been slow in addressing many of its broadacre nutrient requirements and the introduction of an appropriate fertiliser capable of satisfying short and long term needs at a realistic price will be an important issue in the development and expansion of the organic industry.

2. The nitrogen content of high ash meatmeal is of particular relevance to the organic farmer who has access to few products with these relatively high levels, and none to those with commensurate accompanying levels of Ca and P. Important trace elements are present as well, and so is magnesium, which is highly desirable, especially for livestock producers. The conditioning levels of high ash meatmeal are very low as a result of low fibre/cellulose content and even at higher rates of application, no significant gains could be expected in this area. The phosphorus content and reported rates of release are also of major importance, especially if this is the case in alkaline environments where utilisation of citrate soluble phosphorus is limited. The nitrogen levels are of potentially most importance and given that there are no sources of mineral N available to organic farmers, this factor is one which puts high ash meatmeal in a class of it own. When combined with P and Ca levels, the product appears to demonstrate an effective and affordable alternative.

3. From 1992, when the National Standards for Organic and Biodynamic produce were first implemented for export, there have been definitions and requirements put into place which have the force of law behind them. (For export only). These Standards then became the basis upon which the four current certifiers who are audited by AQIS for conformity to National Standards, must conform. Those 5 certifiers are currently the National Association for Sustainable Agriculture Australia Ltd (NASAA), the Biological Farmers' of Australia (BFA), Biodynamic Research Institute (BDRI), Organic Herb Growers' of Australia (OHGA) and the Organic Vignerons' Association (OVA). In 1994 NASAA became accredited by the International Federation of Organic Agricultural Movements (IFOAM). The consequences for the organic industry with this accreditation of the largest certifier were that the Basic Standards of IFOAM would need to be adhered to and indeed NASAA is audited on its compliance with those standards.

4. There are no significant restrictions placed on the bone/meatmeal fraction by the regulatory mechanisms within the certified organic agricultural industry. Indeed, the product is accepted in general as meeting those criteria which would allow for its accepted use, although clearly sole reliance on such a product would not be tolerated.

5. Of significance possibly in the future, is the perspective that organic certification/regulatory bodies may use when determining the suitability of fowl manure and other intensive animal industry sources. A tightening of those criteria for acceptance by Australian certifiers in accordance with either international dictum or national perception may be the most significant factor of a regulatory nature to have effect on a bone/meat meal fertiliser, although this is not likely in the near future. The absence of those fowl manure and other intensive animal manure sources would have a significant effect on fertiliser availability in many horticultural operations and provide an ideal environment in which alternative fertilisers, including bone/meat meal could be marketed. Also of significance is the level of heavy metals permitted in phosphatic fertilisers. If this level cannot be reached by phosphatic rock products, then a useful market niche may be developed by a bone/meat meal product.

6. Medium-sized grain growers, horticulturalists, vignerons, orchardists and dairy farmers is the group of certified growers which is most likely to be consumers of fertiliser inputs. These operators have annual incomes from between $20,000 pa up to around $200,000. In June 1997, NASAA reports a total certified area of over 7 million hectares. In terms of farm gate and factory floor value, the total value of the organic industry is likely to be a little more than the $80 million quoted in the Hassall report last year and be around $100 million. Retail sales are far in excess of this figure.

7. The export market opportunities for certified organic produce are seemingly huge ones with orders for horticultural produce in particular, far outstripping supply. NASAA has attended several major international organic food/fibre trade shows (Biofach in Germany for the past three years, the IFOAM Trade Fair in Copenhagen and Foodex in Japan) and directly witnessed the enormous demand for certified organic product. Those areas displaying substantial and usually unmet demand include the following: Fruit (temperate and tropical); mixed vegetables with the exception of potatoes; Durum wheat and product; grain legumes; rice; dairy products; wine; coffee and spices; and a wide range of processed foods.

8. There are fertiliser replacement requirements in two major sectors which will be of significance as growth potential is realised. These are broadly in horticulture and grain production. Horticulture in general has a high requirement for fertility inputs especially N and is currently paying a high price for N and P. Grain (including oilseeds, pulses and rice) production is currently a minimal to non-existent user of fertiliser, but with ongoing demand and likely growth, will require affordable and available P in addition

to N. The capacity for bone/meat meal fertiliser to provide a significant portion of this need is realisable.

9. A fertiliser needs to be one which can be handled and spread easily. Very fine materials are both physically problematic to spread and present risks to workers and handlers. Pelletised products are moderately easy to handle and well accepted by the organic farmer. The granules are superior in terms of handling and spreading with many similar characteristics to the conventional fertilisers and are seen as more concentrated and should be considered as a superior option in a fertiliser development program for a high ash meatmeal fraction. Special attention should be paid to product uniformity and freedom from foreign objects. The process of composting and the use of a variety of sources of animal manure can see objects enter the mixes of some products, despite screening. These are very problematic in maintaining consistency with banding application devices. A further contaminant is labels which fall off after the bag is opened, entering the fertiliser box and causing blockages. An important physical dimension of the fertiliser package is the nature of securing the bag container. Sewing with machinery which enables easy location of string ends and easy opening of bags enables cutting of bags to be avoided for recycling.

10. The option to create blend is a compelling one for the utilisation of high ash meatmeal fraction. The need to modify the physical characteristics in the product in line with the earlier discussion is important. The addition of potassium and sulphur component will be of use with the generally on-going requirement for these elements in addition to trace elements such as copper, molybdenum, manganese, boron and zinc. There is provision under the organic farming standards to make additions of those major and trace elements.

11. The distribution options of stock and station agents; specialty organic suppliers; hardware and rural produce merchants; direct from manufacturer; major fertiliser manufacturers; and custom spreaders and handlers all have merit and it is not uncommon to see certain products distributed through more than one of the above methods. Usually, franchise arrangements are made and areas are divided up and distributors given some exclusive distribution rights. Depending on the level of penetration which might be anticipated into the conventional market, the distribution methodology will vary. If one could expect to find significant clients amongst the conventional sector, then distribution through a major fertiliser chain will be of merit, as there is obviously a potential level of exposure which would not be present through a more eclectic distribution pathway. If the target is to be the alternative organic farmer, then there may be some resistance (limited) to buying through the conventional sector. Given the still limited volumes of fertiliser used by the organic sector and the fact that large distributors

have already embraced a number of organic products (pelletised manures, rock phosphates and other minerals), there would be a distinct advantage in attempting to establish a distribution chain through an established fertiliser company.

12. Clearly, the volumes of fertiliser used by organic farmers are still relatively low and any marketing and promotional exercise should be aimed at further groups in addition to currently certified organic farmers. To conventional farmers the promotion message should be that the product is a balanced fertiliser with a range of nutrients and it is natural. To the organic sector the promotion message should include its efficacy and provision of essential nutrients, that it is approved* or certified*, its naturalness and the ecological dimension that it is the recycling of animal waste to the land from which it came. The combination of these factors in a marketing campaign could be achieved through certification of a supplemented granulated product which emphasises: the valuable P content; the valuable N content; the valuable Ca content; the natural composition of the fertiliser; the bones and the return of these to the land, thus closing the cycle of nutrients so often lost from the land.

13. Certification and approval of fertilisers can be obtained through a number of certification organisations. The process of certification involves on-site inspections on an annual basis and a 0.5% levy on sales. Approval requires a desk audit, an annual fee of around $150 and inclusion on an approved list.

14. The high ash meatmeal fraction has a legitimate role in certified organic agriculture and is acceptable under organic farming standards. It is competitive with existing fertilisers in use in organic agriculture. It has the capacity to exploit a variety of product niches particularly in the animal manure-based and reactive rock phosphate and guano sectors. The trace element composition of bone/meat meal is valuable and favourable for the organic farmer who, farming in a more limited macro nutrient regime, is especially reliant on an enhanced spectrum of micronutrients. Of importance is the calcium and magnesium component which assists with providing a useful balance for the organic farmer. The product also supplies an important Mg component for organic livestock farmers who have long recognised this element in its role in the prevention of serious metabolic disorders in livestock.

15. Twelve major recommendations are made on the development of high ash meatmeal as a fertiliser for use in organic farming.

RECOMMENDATIONS

1. A fertiliser blend which achieved a broader spectrum of nutrients, a granulated form, organic certification and an appeal to the conventional sector would be the first option worth considering.

2 New marketing approaches will need to be cultivated to reach current extensive organic grain/livestock operators where greatest potential in terms of volume currently exists.

   The development of that market will be dependent on:
   - Perceptions and understanding of sustained nutrient base saturation rates
   - Recognition of nutrient replacement requirements
   - Belief and acknowledgment that fertiliser claims are demonstrable.
   - Observation that cost/return factors over short and long term are favourable.

3. The raw and unmodified fraction could be provided as a base mix for the existing organic fertiliser industry. This would dispense with much of the need for a development and promotional program but would jeopardise potential turnover if pricing mark-ups by the downstream manufacturers were consistent with current patterns.

4. A strategy which was aimed at the market for the next 10 years would need to account for a substantial growth potential realised within the organic sector during that time.

5. The emphasis on the recycling of nutrients through the bone fraction should be a characteristic of the positioning of the product.

   Amongst the important characteristics of the bone/meal fraction, is the source. The reality of nutrient loss from agricultural lands is seen not only in erosion and soil loss, but from the one way passage of nutrients via the export through cropping and animals. Difficulties arise in recycling human nutrients and sewage use is prohibited in organic agriculture. Animal manures from the current intensive animal industries are held in some suspicion by both farmers and consumers of organic foods. The recycling of animal tissue, especially bone could be seen as a relatively clean (BSE notwithstanding) and importantly ecological activity. (Requirements placed on consumable meat products would see resultant offal easily passing tests of contamination as a fertiliser).
   Unlike the animal manure products, there is a limited perception that the use of this waste material by organic farmers is a solution to a major environmental pollutant arising from a sometimes questionable animal production system. Although the bone/meat fraction may equally arise from the intensive feedlot

industries to Australia, the promotion of the product as not only organic, but with independent environmental value would assist with market positioning.

6. The product should be distributed through major fertiliser chains if possible. In the absence of such an opportunity, selected organic fertiliser distributors should be provided with strict licensing arrangements from the manufacturer. The selection of distributors capable of meeting objective criteria in understanding and advising on organic nutrient management should ensure that credible and sound advice is available.

7. Marketing should take place to three areas in particular:
   - The certified organic horticultural sector
   - The certified organic grain sector
   - The conventional "sustainable" farmer who can benefit from the non acid source of P in contrast to superphosphate.

8. Pricing should be aimed at rates commensurate with actual nutrient value in relation to P in RPR and N in blood and bone.

   Price sensitivity is noted in the organic fertiliser industry with two patterns observed.

   - The shopping for nutrient value.
   - The failure to use fertilisers when faced with the relatively high cost of nutrients.

   It is likely that a significant re-orientation of pricing which saw a more realistic price for nutrients would precipitate investment by currently nil to low input users.

9. Further research should be carried out to determine the P availability from a bone/meat fraction in moisture limited, biologically unmodified and alkaline environments.

10. A series of field trials should be carried out with certified organic growers from around Australia. NASAA would be happy to assist with providing contacts and assistance.

11. The Organic Federation of Australia should be approached by the MRC with a request for assistance in researching and promoting utilisation of the bone/meat ash fraction as a fertiliser for use in organic agriculture.

12. RIRDC should be approached through the Organic Agriculture R & D subsection with a proposal for joint research in trials with the MRC. Collaborative work involving producers, a recognised independent scientist, the MRC and a selected non-government organisation such as NASAA should be nominated as co-applicants in an Australia-wide trial.

1.1.0 PREFACE

In the examination of the high ash fraction of bone/meat meal, and its relative merits with relation to other fertilisers available to the organic agricultural sector, a brief discussion of the principles of soil fertility is warranted. There is a significant difference between soil fertility practices espoused by organic producers and that of the conventional agriculture sector. It is also true that within the organic sector, there are a variety of principles and practices which include replacement of N, P and K by other sources such as animals manures and waste products, but there exists a growing understanding that the quality of production is influenced by a holistic approach to soil fertility which is expressed as a balanced soil fertility which is capable of supplying those nutrients required by the plant and no more.

"When the effects from fertilisers on soils are measured only by the yield variations in vegetative bulk, recorded in tonnes or bushels, there is little chance that we shall recognise crop differences demonstrating the varying effects between the use of inorganic and organic fertilisers.. Our animals, however, tell us that the crops nutritional quality reflects the different organic and inorganic compounds feeding the plants. When we learn to measure the crops responses to soil fertility by more than bulk values an ash differences, then the contributions of the soil, both organic and inorganic, to plant nutrition will be more correctly realised" (Albrecht)

The role of a bone/meat ash fraction meal should be seen within this context and in any promotional and marketing strategy which will be the subject of this report, a recognition of the role of those high ash fractions within a balanced soil fertility strategy will be important.

The relatively low levels of nutrients of all kinds in the most ancient Australian soils are worthy of some comment. It is generally recognised that low levels of P characterise most Australian soils and the strategies and practices of P supplementation are well documented. Similarly, S requirements for grain quality in particular have been well covered both theoretically and practically through superphosphate use.

K has also received significant attention especially in relation to pasture response, but the trace elements and Ca and Mg are often well recognised as primary areas of importance for qualitative production by the organic grower.

1.1.1 FACTORS OF RELEVANCE TO FERTILISERS WITH RELATIVELY HIGH NITROGEN CONTENT

As a fundamental nutrient for plant growth, nitrogen has received voluminous attention, but frequently with relation to deficiencies. Any fertiliser with relatively high values in relation to other nutrients is regarded in the organic industry with a degree of caution. Lodging, pest attack and product quality and storage times are often quoted as deficiencies resulting from excessive N usage.

Furthermore, with a strongly oriented focus on nutritional quality of food, nitrate measured in leafy vegetables in particular is recognised to be seriously inflated with high N inputs. This usually means that the spectrum of other available nutrients, especially the nutrient cations, can be compromised and indeed, the foodstuffs can have deleterious health effects.

"When the nitrate is ingested, it passes into an environment in which Oxygen is in demand.; the nitrate is converted to nitrite, and the latter is toxic. This nitrite, once in the blood stream, combines with the blood. It produces a methaemoglobin to prevent the blood from supplying oxygen to the tissue and thus the body suffocates...." Wilson JK. Journal Of American Society or Agriculture 1943.

The N contents of various fertiliser discussed in this report are admittedly on the lower end of the scale in gross percentages. However, in the application of these fertilisers without a balanced fertility perspective, and in volumes which may be substantial, the replacement of other nutrient cations with N becomes a factor which is recognised by the organic industry.

There is a general understanding amongst those who have been engaged in the organic industry for some time, even within the relatively low analysis fertilisers available, that over application of N resulting in over-dependence on fowl manure products and blood and bone is a reality.

The regulatory positions with regard to these issues will be discussed in the second section of this report.

1.1.2 SOME REALITIES FACING THE ORGANIC INDUSTRY

There is an opinion that the organic grower is a non user of fertiliser inputs and to some extent that view is correct. Whilst the possibility of overuse is limited, under-use of fertilisers is more problematic on many larger properties with grain, pasture or even horticultural production.

The reasons behind this are varied. There is a perhaps a philosophical view that the system should be a closed one and this belief is widely held. Indeed, the standards all call for some closure of the production system with the intent of regenerating biological systems, recycling as much nutrient as possible, and limiting those pathogenic organisms or contaminants which may enter the farm in any way.

It is often a mistaken view that nutrients should not be brought onto the organic farm or that they should be minimised. Whilst minimisation to levels which promote optimum in favour of maximum growth are acceptable, given problems of excessive nutrification, the consequence of the view of relative non-use is that there are some seriously undernourished production systems within the organic sector, and others with a questionable long term future at even current levels of nutrient extraction.

This view is often argued by practitioners who have correctly pointed out that enhanced biological activity exhibiting high levels of VAM and other indigenous or exotic soil organisms, can mobilise those reserves of P, for example, which would otherwise be limiting. There is abundant documented and anecdotal evidence that indeed the innate reservoirs of nutrient can be enhanced under an organic approach to soil fertility.

The use of livestock within organic farms is another requirement which assists with nutrient cycling and there are other means by which fertility can be enhanced.

There is not, however, a long term answer which has been put forward by those adherents to those systems, to the issue of nutrient reserves. Unless one considers the replacement of nutrients, the crunch must come.

Most operators, however, are pragmatic in regard to this question and the answer to the question of their low input history is one of costs and returns.

The explanation of this and its impact on the possibilities for an ash bone/meat fraction will be subject of section 3 of this report.

The organic sector has been slow in addressing many of their broadacre nutrient requirements for these and possibly other reasons, and the introduction of an appropriate fertiliser capable of satisfying short and long term needs at a realistic price will be an important issue in the development and expansion of the organic industry.

1.1.3 BASIC COMPARISON OF FERTILISERS CURRENTLY IN USE WITH AN ASH FRACTION OF BONE /MEAT MEAL

Those fertilisers in use which are broadly included within the same category as bone/meat meal are the solid fertilisers which can be divided into 4 groups for practical purposes.

i The animal manure derived products

ii The animal waste products

iii The mineralised products

iv The composts and soil conditioners

v Other

i Animal Manure Derived Products

This is one of the most expansive lists and includes both bagged and bulk products such as compost. A selection of those available includes:

a. Dynamic Lifter
b. Terra Firma
c. Nuetrog
d. Fertico
e. Gro Well
f. Diamantina
g. Organotech

ii Animal Waste Based Products

Animal waste products are currently largely restricted to blood and bone.

a. Pivot
b. VicMill
c. Fertico
d. Organotech

iii. The Mineralised Products

Mineralised products include:

a. Reactive rock phosphate
b. Guano
c. Vicmill complete organic fertiliser
d. Various low analysis mineral blends
e. Organotech 5% rock phosphate

iv. Composts and Soil Conditioners

In the compost area, there is a similarly wide range

a. Rockdale Beef compost
b. Wimmera wool processors compost
c. Finn compost
d. Various other sources from time to time, depending on availability
e. Organotech compost

v. Other

A growing area of application is that of worm castings. Whilst currently confined to relatively small scale use, and in a price range for nutrient which is outside of that considered competitive, the soil conditioning characteristics of this product are becoming recognised by many organic and prospective organic operators. Experienced worm casting manufacturers are aware of those desirable characteristics of strata which will result in superior castings products and the role of bone/meat meal in this area should not be overlooked.

1.1.4 SOME FUNDAMENTALS

It is generally recognised that there are a number of criteria on which soil quality, and hence the most appropriate inputs for correction, can be based on.

a. Physical characteristics which include the innate soil structure and its components. Further to innate composition, the characteristics of porosity, bulk density, compaction and moisture status are important.

b. Chemical composition which is an indication of the presence of nutrient ions or molecules and the measure of any other desirable or undesirable salts.

c. Biological activity which is measured through factors such as organic matter levels, microbial respiration.

1.1.5 AN OVERVIEW OF THE ORGANIC PRODUCTION SECTORS (for details see section 3)

The organic agricultural sector is a diverse one and produces an estimated $250m worth of annual production in Australia at present, although figures on production are less than reliable. The range of production spans almost every agricultural sector and most soil and climatic environments. However, production is often divided into three categories:

i Grain

ii Livestock

iii Horticulture

i Organic Grain:

The integrated nature of grain and livestock leaves the general nutrient requirements for livestock (with the notable exception of dairying) covered in part in discussions on grain cropping requirements. Nutrient requirements in grain cropping are fundamentally no different in organic agriculture than in conventional agriculture. The sources of those nutrients are usually quite different, however. Nitrogen sources are usually prohibitively expensive when accessed through organic inputs and consequently there is usually a great reliance placed on long rotations with ample time for nitrogen build-up through legume-based pasture and animal manures, and less frequently (as a result of pest infestation), use of annual legume grains for the provision of nitrogen.

Many organic operators will, however, use small volumes of organic fertiliser with a N content of around 3% at rates of little more than 50kg/ha to give crops a start in assisting with emergence.

The issue of Phosphorous is more seriously considered by most organic grain farmers and the issue of application of P is one which is still not fully reconciled with many operators, especially those with no recent use of phosphatic fertilisers and only very modest use of animal manure/compost imports.

As most of the cereal farming takes place in drier locations in New South Wales, Queensland and WA, and frequently in soils without significant free hydrogen ions, the use of reactive rock phosphate is not widely considered to be efficacious and frequently not used for this reason.

Despite various claims that increased soil microbiological activity will assist in utilisation of otherwise insoluble P in limiting environments, the practical difficulties of building such activity in limiting environments means that P availability for practical purposes from RPR is a difficulty.

The recent use of alternatively sourced Guano by a number of organic grain farmers in the last 12 months has indicated that further use is probably well worthwhile and in a further season more definitive results should be available.

The use of P in the establishment of pasture is the other important dimension of fertiliser use on the organic farm and many operators point this to be a factor equal in consideration to crop yield, especially those attempting to establish high yielding perennial legumes.

Other nutrients contained within the bone/meat meal ash which include Ca are either extremely important in those districts with deficiencies or available in abundance in those cropping soils. They can frequently be applied from other cost effective sources in acceptable forms.

ii Organic Livestock:

There are some important additional factors regarding organic fertiliser on organic animal farms and that is the quality of the feed produced. The balance of nutrients within the soil, and thence within the plant is seen as the basis of animal health and the subject of sophisticated choice and calculation when fertiliser needs are being assessed.

Of particular importance on many properties with otherwise satisfactory level of production is magnesium and the trace elements which frequently include copper and cobalt. In temperate and high rainfall regions, the absence of Mg can be a critical factor in maintaining animal health without the resort to veterinary medicines.

Dairying, in particular as practised organically, exemplifies the critical role of soil balance in animal health and production.

iii Organic Horticulture:

Horticulture in the organic sector is difficult to characterise easily as it is carried out from the Huon Valley to Darwin with almost every crop and soil known. However, the underlying requirements for N and P and K are not dissimilar to conventional horticulture. It should be noted that rotational requirements under the NASAA standards have some effect on the intensity of management of horticulture which sees the mandatory requirement for green manures and or composts for soil conditioning and structural purposes. However, despite these requirements, the need for basic nutritional input is still beyond that which can be recycled or fixed. It is within the horticultural sector that the major inputs of animal manure derived fertilisers takes place. Application rates of 1-3 tonne /ha are not uncommon in addition to a variety of mineral and foliar nutrients.

Because of the relative ease of application and favourable cost/return ratios, fertiliser costs to the organic horticulturalist are nowhere near as critical as the grain farmer. One of the chief requirements by operators and the certifiers is the balance of nutrients applied. Because of the all inclusive nature of the poultry manure derived products, the ratios of K, for example, are not always desirable in relation to other nutrients.

It should be noted that there are restrictions placed by IFOAM and by NASAA on the amount of fertilisers that may be used by horticultural operators (ie 20 tonne compost or 15 tonne of manure product/ha/annum) although these limits are seldom surpassed.

Of note, in the discussion on input products, there is a philosophy and a requirement by organic certifiers to prohibit the excessive use of any input product including fertilisers. The natural recycling and fixing of nutrients from natural on farm sources is a keenly monitored aspect of any operators activity, and operators themselves are largely of the belief and understanding that this is the case and continue to demonstrate the efficacy of legumes, animals and green manures . However, regardless of which certification organisation they are with, there is an undeniable on-going reliance on a certain level of imported nutrient, even with those operators who profess to be able to maintain nutrients using more unconventional methods.

1.1.6 GROWER REQUIREMENTS IN AN ORGANIC FERTILISER

Growers will have a range of nutritional and composition requirements as discussed later in this report, but in the area of specifically organic requirements they must ensure that the product firstly satisfies the organic standards. A number of existing fertilisers are certified by various certification agencies. There is a requirement by at least one certifier to have all fertilisers of this nature certified and history has seen a rapid uptake of this system by many major manufacturers. Other certification agencies have tended to permit those fertilisers on the basis of that certification, but it has been a frequent concern of the organic industry that the capacity to monitor the quality of many products is inherently low. This is true to an extent with all of the manure-based products in that annual inspections and even fewer tests of the material are unlikely to realistically detect any deliberate or inadvertent flaws in product quality.

The grower, is therefore placed in a position of restriction by at least two certifiers on the use of even certified manure-based products.

The grower will need to ultimately bear responsibility for any qualitative deficiencies in product he would use on his property including any contaminants or excessively uncomposted material which may result from any of the above reasons.

The result of this is that many growers have some reluctance to use some of these materials. The perception of contaminant risk from the intensive animal industry with an acknowledged use of a wide variety of veterinary medicines, site treatments and unidentified feed sources is a factor that has seen certain growers switch to a mineralisation policy with on site generation of N and soil conditioning through green manures and compost from known sources.

A further point made by some growers is the balance of nutrients available in bagged animal manure derivatives and the inability to adjust the "package" from the current ratios especially those involving the possibility of excessive K with substantial chicken manure derived product.

Of growing realisation also, is the issue of microbiological contamination, and with a more rigorous (5% PA) testing of organic produce in place by certifiers, the detection of microbiological contamination especially on leafy vegetables from side dressings and in the tissue itself is a real cause for concern.* (C Alenson)

Notwithstanding the above, there is a significant usage by the great majority of organic growers of these bagged products because they are some of the few practical alternatives, especially for horticulturalists .

1.1.7 ORGANIC GROWERS ATTITUDES

These will be more fully explored in the later survey, but there is a widespread attitude that manure products are a less than desirable component of their otherwise contaminant free environment. There are other reasons in addition to the agronomic reasons for use or non use of bagged manure-based fertilisers and they are to some extent ethical ones. Growers have reported that the use of waste from an animal production sector without well recognised animal welfare standards in many cases, is a reason for their non use.

1.1.8 SOME INTERNATIONAL ATTITUDES

It is worth noting that for several years many European certification groups have been pushing to prohibit the use of animal manure from intensive feedlot industries and this was a major area of contention at the recent (April 1997) CODEX Organic Guidelines meeting in Ottawa. Indeed, the Soil Association of the UK, by far the largest certifier in that country, already has a prohibition placed on the use of these products. Whilst the intensity of feedlot activity in Australia is apparently almost free range in comparison with European factory farming, it is worth considering the future of these products in Australian organic use if strict equivalence were to continue to be pursued by Australian certifiers or if Codex guidelines were to go in that direction.

1.1.9 FERTILISERS AND FERTILISER BALANCE FOR THE ORGANIC USER

Organic agriculture shares similarities with many agricultural systems in that nutrient balances are important. It may be said that balances are even more important with organic agriculture in that there is usually less opportunity for excessive nutrients to be present although this is not always the case.

Importantly, however, the issue of applying a desired balance is pertinent. The capacity to manufacture specific fertilisers with a wide range of nutrient balances is more problematic as many of the ingredients required for this purpose are not permitted.

Furthermore, the relatively low analysis of the raw materials makes the manufacture of any high analysis blends impossible.

The necessity for the organic producer to access fertilisers of relatively low analysis/higher costs makes the need for some balance in nutrient an important one.

The principle of feeding the soil to enable a controlled uptake by plants requires that base saturation levels for nutrients are attended to. There is ample evidence that without attention to the optimal levels of individual nutrients within this complex, more or less serious deficiencies may be encountered.

The importance of accessing a fertiliser which is relatively well balanced for the site upon which it is used is not insignificant with organic producers. The range of sites is extensive and no single formulae will be useful in assessing any fertilisers desirable under these circumstances. However, the ratio of nutrients within any fertiliser should , as much as possible, contain an inherent balance of nutrient for most organic growers.
In the 19th century, the German chemist, Julius Hensel, was asked why vineyards in the Rheingan, despite generous applications of potassium, nitrogen and phosphoric acid were affected by phylloxera, nematodes, hay worm, spring worm and fungi causing rust and looked "sickly and poor".

He answered that, "the usual manure does not lack any necessary ingredients, but there is in it, too much of some things, ie of nitrogen and phosphoric acid" (Bread from Stones).

1.2.0 FERTILISER COMPARISON

Manure Based Products

Most of these are very similar with varying levels of N achieved through some additional tissue input. They are all relatively low in Calcium at around 6-8% but similar in NPK. Many trace elements are included along with sulphur and some Magnesium. Free nitrogen levels vary but can be a significant proportion of the N content.

Conditioning characteristics are evident with voluminous applications, especially in horticulture, although at broadacre rates this effect is very limited.

The propensity for over-use is usually only if raw manures are brought in. The use of brought in raw manures is not permitted without composting on organic farms and all fowl manure must be composted, but the risk of excessive application is possible on non certified farms.

Microbiological activity contribution directly is limited by restricted volume of application, although contribution to immediately available energy reserves can be of some significance, depending on application rates.

Contribution to a long lived nutrient fraction and base level saturation are varied with the risk of a variety of excessive nutrients combined with only modest levels of others. Some accumulation is evident at significant applications, although usually under these circumstances, high demands are placed on soil fertility.

Animal Waste Products

These are commercial blood and bone products and are sometimes cut with manure-based product. Their composition and relative characteristics are generally well-known. For organic production, these products have a more confined field of nutrients given the earlier discussion on balanced fertilisers, in particular, K, Ca and Mg.

The addition of RPR to some product could also explain the relatively low levels of use.

Some blood and bone products have been shown to be fortified with N from industrial sources and as consequence, blood and bone is sometimes avoided by organic growers for this reason.

It should not be forgotten that there are a small number of growers who , being vegetarians are unwilling to employ animal tissue as a fertiliser.

The conditioning characteristics of B&B are very low as a result of low cellulose content and even at high rates of application, no significant gains could be expected in this area.

Finally, unit price is another factor explaining relatively low levels of use. The perception that in addition to the usually more economically attainable P content, there is really only a N purchase is significant to the organic grower who will generally need to purchase other nutrients which will necessitate purchase of another proprietary "package".

Furthermore, the nature of some restrictions on the use of the product by certification organisations which are based on the propensity for overuse and its relative imbalance should be noted.

Composts and Conditioners

The range of these products in use by the organic production sector is extended by those products manufactured on farm. These products are applied in volumes up to 20tonne/ha and provide nutrient levels of around 1% or less of major nutrients. They have signified effects on fertility levels when applied generously, but have an important role as a soil conditioner through the addition of microbiological activity and organic matter levels.

The difficulty of procurement of fully composted material in most cases, combined with the added task of on-farm composting for brought in raw materials limits the use of these products in many regions. However, there appears to be more of this product becoming available and this could mean that greater numbers of organic operators will have access to finished product in particular.

A significant factor in a variety of these products is the salt levels. Levels become significant at applications of volumes up to 20t/ha, although in comparison to wind and weather borne salts, even in inland areas, this figure is in the same order.

Mineral Based Products

Mineral applications to soil on organic farms is a fundamental and widely practised activity. Based on understandings of nutrient balance and the long history of organic fertilisation being intrinsically founded on correct mineral levels, the application of limes, dolomites, rock phosphate and other rock dusts is a highly developed agronomic practice in organic agriculture.

Those minerals most frequently used are lime, dolomite, gypsum, RPR and a variety of low analysis rock dusts. Many of the rock dusts contain modest levels of K and are sometimes accompanied by microbiological inoculums to enhance their uptake.

The importance of calcium and magnesium should be noted here as they are fertiliser ingredients which are common limiting factors in many horticultural and cropping regions in Australia.

The RPR phosphate fertilisers show excellent efficacy in active, acidic soils in high rainfall zones without significantly affecting Olson P levels on those sites. Cd levels will preclude many of these products from use in the organic system.

Nitrogenous salts are not used or permitted on the organic farm, even products from naturally occurring deposits such as Chilean Nitrate.

Potassium sulphate is a restricted but often used product when a deficiency can be demonstrated.

Ash Fraction Product*

Levels of calcium contained within the high ash fraction of samples A & B* of table 1 - page 18, is of significance for the reason that the nutrients are considered important by organic farmers who recognise these deficiencies in many regions.

Phosphorous content and reported rates of release are also of major importance, especially if this is the case in alkaline environments where utilisation of citrate soluble phosphorous is limited.

Nitrogen content in the product is of particular relevance to the organic farmer who has access to few products with these relatively high levels, and none to those with commensurate accompanying levels of Ca and P.

The conditioning characteristic of the material is likely to be low in all circumstances.

Infusion of significant microbiological ingredients will be similarly low but the provision of modest energy levels through the fat portion are likely.

Important trace elements are present, and so is magnesium, which is highly desirable especially for livestock producers.

Contamination potential:

The spate of meat contamination events in recent times would be considered by many growers to be significant in their judgment of the organic suitability of a bone/meat product. Helix, Endosulpan, Dieldrin and possibly, heavy metals, would not go unquestioned. Perceptions of microbiological contamination through exotic disease would also be considered by some operators. Generally these risks could be considered as being very low however.

The nature of any Restrictions by Certifiers in relation to application rates and duration of use are also factors of relevance. (Refer Section 2).

Further issues of cost, availability, performance and handling will be covered in section 3 of this report.

1.2.1 CRITERIA FOR COMPARISON

A basic comparison of organic fertilisers can be carried out under the following criteria:

a. Nutrient Analysis (Table 1)

b. Price

c. Conditioning Characteristics

d. Nutrient Availability

e. Other nutrients included

f. Other factors of efficacy

g. Accessibility (See Section 3)

h. Handling Characteristics (See Section 3)

i. Organic acceptability/restrictions (See section 2)

Nutrient Analysis
For immediate comparative purposes, the 3 major nutrients, Nitrogen, Phosphorous and Potassium are used. These by no means express the full picture of efficacy as discussed below.

Price
This is expressed in Table 1 as a tonne price in 50 kg bags without transport costs from major handling depots or places of manufacture.

Table 1 showing analyses of 4 types of ash fractions of meatmeal

Parameter	Sample A	Sample B	Sample C	Sample D
Nitrogen (%)	4.7	5.0	7.2	7.4
Protein (Nx6.25) (%)	29.4	31.2	45	46.2
Ash (%)	60	58.9	37.6	39.2
Calcium (%)	23.7	24.4	8.3	9.1
Sodium (%)	0.52	0.54		
Potassium (%)	0.04	0.06		
Iron (mg/kg)	18.3	26.2		
Copper (mg/kg)	6.8	6.8		
Zinc (mg/kg)	30.0	32.6		
Total Phosphorus (P) (%)	12.2	10.5	6.82	6.78
Water soluble P (%)	0.02	0.085	0.19	0.30
Citrate insoluble P (%)	10.7	9.2	5.0	4.4
Citrate soluble P (%)	1.48	1.22	1.63	2.08
"Available" P (total - citrate insoluble) (%)	1.5	1.3	1.82	2.38

Conditioning Characteristics (1-5)
This is expressed crudely as the fibre/cellulose content at least and includes the optimal content of stable humus colloids capable of improving soil structure, CEC and organic matter. This does NOT refer to the regulatory definition of conditioners which tend to be those products which do not conform to various nutrient level criteria.

Nutrient Availability (1-5)
The relative availability of nutrient content over a period of time or in limiting environments.

Other Nutrients (1-5)
Reference to significant Ca , and trace elements. *"The efficient utilisation and elaboration of nitrogen by plants, both legume and non legumes, calls for a liberal supply of calcium, phosphorous and other mineral fertiliser coming from the soil., as well as the necessary supply of nitrogen. The physiological demand for calcium by the plant has been almost blanketed out and put into a lesser significance in our thinking by believing that lime was beneficial for crops only through its reduction of the degrees of soil acidity."*

Other Factors (1-5)
Paramagnetic properties or other forces.

Accessibility (1-5)
Accounts for volumes available and transport costs(Section 3)

Handling.(1-5).
Includes manufactured form and flow and handling characteristics (Section 3).

Acceptability/Restrictions
This will be treated in Section 2 in some detail.

1.2.2 COMPARISON WITH PELLETISED OR OTHER FOWL MANURE BASED PRODUCTS

The range of nutrients, and the levels of those nutrients would appear to place a high ash meatmeal product at a substantial advantage to the fowl manure based products. Differing balances could be intrinsic advantages to many growers and the price per tonne of nutrient components would place the bone/meat ash at a considerable advantage.

1.2.3 AN ORGANIC FARMER'S EXPERIENCE WITH RPR

One certified organic farmer in Central Victoria has been using various brands of RPR on Chernozem soils for over 10 years. Whilst there have been no controlled experiments carried out to quantify results, some points are worth commenting on in relation to the possible efficacy of a bone/meat meal providing useful phosphorous in the field.

A site description is enclosed in annex 3.

a. Results are obvious in first crop after application of RPR.
b. Potato crop response is very favourable.
c. Pasture and legume establishment and durability is high.
d. After 1.5 t/ha applications there is negligible change to low Olsen P levels

1.2.4 COMPARISON WITH MINERAL SOURCES OF P, N and Ca

Clearly, sources of equivalent P can be accessed more economically using the RPR products. Assuming that P availability is the same, then the product, based on P alone, would be less than competitive. If P is more available, as has been suggested in trials by J Y Langdon, then areas not conducive to RPR usage would be opened up to potential use of a bone/meat ash.

The N levels are of potentially more importance and given that there are no sources of mineral N available to organic farmers, this factor is one which puts the bone/meat ash in a class of its own. When combined with the P and Ca levels, the product appears to demonstrate an effective and affordable alternative.

The Ca content can clearly be matched and surpassed by mineral products which can be easily accessed at much lower prices, but this element is one which could be seen as an attractive additional extra in a fertiliser, although certain RPR products of Middle Eastern origin can also boast Ca levels at similar rates.

1.2.5 COMPARISON WITH COMPOSTS AND CONDITIONERS

Whilst these products are typically of relatively low analysis, (see annex 1), they have a high conditioning characteristic and add a level of microbiological activity. These products are also relatively low in cost and are available in very large volumes. (Rockdale, for example, produce in excess of 40,000 tonne per annum).

The positioning of a bone/meal ash fraction in the marketplace would need to take into account the current demand and use of these products which are especially popular amongst growers in horticulture and grain in the drier and sandier soils where considerable increases in production are reported by growers who have supplemented their continuing fertility regimes with composts.

1.2.6 OTHER COMPARISONS BETWEEN EXISTING ORGANIC FERTILISERS AND A BONE MEAL FRACTION

The meaningful comparisons between the above fertilisers will need to take place in the field. It is really only when applied under a range of conditions in significant areas that a useful result will be guaranteed. It is therefore speculative to draw any significant inferences as to the efficacy of the bone meal materials until such time. However, if the results of RPR usage are a comparison, then it is clear that the range of uses and districts may be greater than those identified in earlier reports.

If one looks further at the N content of the meal product, then a considerable comparative advantage is apparent over any of those materials available. The behaviour of this nutrient in the soil cannot be determined without trials, but it could be expected that it would be extremely useful under an organic regime, where there is a desire for naturally occurring N which is possibly less volatile than manure sources.

2.1 BACKGROUND TO STANDARDS DEVELOPMENT

Critical to an examination of the potential role of bone/meat meal in organic agriculture, is an understanding of the role of fertilisers in organic agriculture and in understanding that role, the rationale behind the categorisation of fertilisers is important as is the regulatory frameworks within which categorisation is determined.

The Australian organic industry is over 10 years old and has developed from a small movement to an industry with an annual value of approximately $250m.

From 1992, when the National Standards for Organic and Biodynamic produce were first implemented for export, there have been definitions and requirements put into place which have the force of law behind them. (For export only). These Standards then became the basis upon which the four current certifiers who are audited by AQIS for conformity to National Standards, must conform. Those 5 certifiers are currently NASAA, BFA, BDRI and OHGA and the OVA.

The National Association for Sustainable Agriculture Australia Ltd was originally formed as a peak body and certifier in the early 80s. It was soon joined by the BFA and embarked upon promoting and certifying organic production systems. It has remained a proponent of promotion which has been chiefly achieved through world parity certification. It has interests represented from growers, general membership and a range of professional associates.

The Biological Farmers' of Australia is a co-operative which has sought to include advice and marketing assistance along with its regulatory role. It has been subject to a turbulent recent history as it struggles to reconcile its advisory/marketing role and it regulatory one. It has been traditionally composed of certified farmers only.

The Biodynamic Research Institute is a specialist organisation which promotes and advises on biodynamic methods. It has a strong grower/certifier relationship which extends beyond the farm gate. It has a membership led by a strong central committee.

The Organic Herb Growers' of Australia is based on certified herbs and is supported by other structures within that industry. It has recently expanded to certify other products and is beginning to command a large portion of certified growers in Australia with a very low cost service. It has a membership chiefly from the herb growing/marketing sector.

The Organic Vignerons' Association is a newcomer and specialises in grape products and is still relatively unknown outside those circles.

A recent development has been the training of the inspectorate which is now a separately organised body which provides a more homogenous inspection/reporting role across sectors of the organic certification industry.

Furthermore, another development took place in 1994, when NASAA became accredited by the International Federation of Organic Agricultural Movements (IFOAM). The consequences for the organic industry with this accreditation of the largest certifier were that the Basic Standards of IFOAM would need to be adhered to and indeed NASAA is audited on its compliance with those standards.

It should be noted that at present there are no domestic food regulations which relate to organically labelled foods despite submissions before the ANZFA for almost two years.

2.2 ORGANIC STANDARDS

There are 4 levels of determination in place when a product or a practice is considered for its suitability to organic farming.

a. The National Standards

b. The IFOAM Standards

c. The Private Certifier Standards.

d. The CODEX Guidelines for the Production, Processing and Labelling of Organically Produced Food.

Fertiliser usage should be seen within the context of organic agricultural aims and especially within the context of building soils. The following describes one of the fundamental principles of organic agriculture.

"Optimum soil fertility, soil structure and biological activity are the fundamental aims of organic soil management."

"The aim of nutrient management on organic farms shall be to supply nutrients to the plant via the soil rather than directly to the plant. For example, permitted fertilisers shall be assimilated into soil by soil organisms and the nutrients slowly released to the plants."

"Nutrients should be maintained through practical methods of supplements, cycling and biological activity.

The use of mineral fertilisers should satisfy crop requirements for optimum, not maximum, production.

In heavy feeding crops, the use of inputs should be applied with reference to proper understanding of soil nutrient levels and crop requirements."

(NASAA Standards 1997)

The National Standard takes a more definitive approach to fertility with the following statement in section 3.2:

The aims outlined above are achieved with soils of enhanced biological activity, as determined by the humus level, crumb structure and feeder root development such that plants are fed through the soil ecosystem and not primarily through soluble fertilisers which are added to the soil, Plants grown in organic systems take up nutrients that are released slowly from humus colloids, at a rate governed by warmth. In this system the metabolism of the plant and its ability to assimilate nutrients is not overstressed by excessive uptake of soluble salts in soil water (such as nitrates). Therefore the development of soil structure is fundamental to organic farming systems. Organic farming systems rely to the maximum amount feasible upon crop rotations, crop residues, animal manures, legumes, green manures, mechanical cultivation, approved mineral bearing rocks and aspects of biological pest management to maintain soil productivity and tilth, to supply plant nutrients and to control diseases, insects, weeds and other pests.

The Biological Farmers of Australia point out in relation to soil;

*Using these methods (*Biodynamic and Organic*), producers accept responsibility to improve the soil and the environment through humus building, enhancing natural biological activity, soil fertility and soil structure.*

Within the above context, and with the proviso that desirable soil characteristics are being enhanced and that any levels of contaminants are below acceptable levels, fertilisers are eligible for use.

The following table describes those levels commonly referred to in reference to heavy metal contents. The following figures are the maximum concentrations of heavy metal permitted in soils and fertilisers/conditioners.

	IN SOIL		IN FERTILISERS/ CONDITIONERS	
	mg/kg	kg/Ha	mg/Kg	kg/tonne
zinc	150	336	1000	1.000
chromium	150	336	1000	1.000
copper	50	110	400	0.400
lead	100	220	250	0.250
nickel	50	116	100	0.100
cadmium	2	4.4	10	0.010
mercury	1	2	2	0.002

(Used by NASAA, BFA and the UK Soil Association)

2.3 INPUT PRODUCT LISTS

a. **In the National Standards** Annex 2. "Permitted materials for use in Soil Fertilising and Soil Conditioning" permit the unrestricted use of bone and meat meal as of the revision of 25th March 1997.

b. **The IFOAM** Basic Standards Appendix 1. "Products for Use in Fertilisation and Soil conditioning" states, "Restricted inputs are inputs for which there are conditions for use, as given by the Certification Programme. These conditions, ie amounts, current crops, etc have to be settled for each substance listed below individually beforehand by the certification programme.

Under "Other Organic Matter", blood meal, meat meal, bone meal and feather meal brought in from other (non-organic) sources and without preservatives are described as "Restricted- risk of contamination"

c. NASAA lists in annex 1, "Products for fertilisers and conditioners", bone, meat and blood meal are listed as restricted and there are three specific criteria established which define the nature of restrictions.

For bone meal, the criteria of product specification, ie contamination, is listed as the determining factor. In other words, if levels of contamination fall above those listed, the product will not be permitted.

For blood and meat meal, the additional factor of application rates is listed. For example, the use of such fertiliser will need to be within the context of an integrated fertility maintenance program and sole reliance on N input from the blood/meat meal alone is not permitted

d. **In the CODEX** Annex 2, "Substances for use in soil fertilising and conditioning", the following appears:

Processed animal products from slaughterhouses and fish industries. Conditions for use are "need recognised by inspection body"

e. **Other inspection bodies within Australia (BFA, BDRI , OHGA and OVA)**

The Biodynamic Research Institute is not known to have a set of written standards that deal with input products and is believed to use the National Standards as its own. The National Standards permit the use of bone and meat meal .

The Biological Farmers' of Australia permit the use of bone and meat meal in consultation with the Standards Council. Interestingly, at least one range of blood and bone product has been certified as organic by the BFA, which suggests that it may not only be used without restriction but it is considered organic.

The Organic Herb Growers' of Australia has no restrictions on the use of bone/meat meal.

It is unclear, although unlikely, if the OVA has any restrictions on a bone/meat product.

2.4 ASSESSMENT CRITERIA

The acceptance of products for inclusion in the lists of suitable products therefore becomes subject to these levels of appraisal and the criteria developed by those organisations.

a. National Standards

The OPAC (Organic Producers' Advisory Committee) group which comprises representatives from the accredited certifiers, Agricultural Departments, National Farmers' Federation, ORGAA (Organic Retailers' and Growers' Association of Australia), the Australian Consumers' Association and AQIS carry out regular reviews of the National Standards with the next major review to be completed by the end of 1997. This group is cognisant of several factors when drawing up Standards and they include:

i. The principles and aims of organic agriculture.

ii Precedents set in organic agriculture.

iii Consumer acceptance of products and practices.

iv. Maintenance of equivalence with major importing groups in particular (ie the EEC)

b. **The IFOAM** Standards committee carries out a revision of the IFOAM standards every two years (the last being completed in early 1997) and uses the following criteria for the purpose of determining the suitability of input products in particular.

i **Necessity**
Each input has to be necessary/essential. This will be considered in the context in which the product will be used. Firstly, all alternatives have to be investigated, including inputs which are already in organic production. Arguments to prove the necessity of an input may lay in the field of yield,

product, quality, environment or ecosystem protection, landscape, man and or animal welfare.

The use of an input may be restricted to:

a. specific crops (especially perennial crops)
b. specific region(s)
c. specific conditions (environmental, handling) under which the input may be used. eg, the amount used per hectare per year may be restricted to minimise negative effects on the environment.
d. The location where the inputs are applied. eg no direct contact with the organic product.

ii. **Nature and Way of Production**

The origin of the input must be:

- organic (animal or vegetable) or
- mineral.

Non-natural products which are chemically synthesised and identical to natural products may be used, (eg. acetic acid, alcohol, pheromones). Chemically synthesised products may only be allowed in exceptional circumstances and preferably on a temporary basis. When there is any choice, renewable inputs (use not in excess of natural regeneration) are preferred. Second choice is inputs of mineral origin and third choice is inputs which are chemically identical to natural products. There may be ecological (see point 3), technical (eg required purity or concentration of the wanted matter) or economic arguments to allow for the use of chemically identical products.

Way of Production

The ingredients of the inputs (which will be organic or mineral products in most cases) may undergo the following processes:

- mechanical processes
- physical processes
- enzymatic processes.
- processes by means of (micro) organisms. (eg composting process, digestion)
- chemical processing will only be allowed in exceptional circumstances.

Winning or Collection

The winning or collection of the (raw material) input must not affect the stability of the natural habitat nor affect the maintenance of the species in the collection area, (eg the collection of calcium fertiliser from coral reef).

iii. Environment

Environmental Safety
The input must not be harmful to or have lasting negative effects on the environment (plants, animals and micro-organisms). Nor should the input give rise to unacceptable pollution of surface, ground or well water, or air or soil. All stages during processing, use and breakdown must be evaluated.

The following characteristics of the input must be taken into account:

Degradability
All inputs must be degradable to CO2,H20 and/or to their mineral form.

Inputs with high acute toxicity to non-target organisms should have a half-life of maximum 5 days.

Natural substances used as input which are not considered toxic (eg compost extracts, manure) do not need to be degradable in a limited time.

Acute Toxicity to Non Target Organisms
When inputs have a relatively high acute toxicity for non-target organisms, restrictions on their use is required. Measures have to be taken to guarantee the survival of these non- target organisms, (eg adequate "safe places for survival" on the farm-land, reasonable distance from surface water etc). Maximum amounts allowed for application may be set. When it is not possible to take adequate measures, the use of the input must not be allowed.

Inputs which accumulate in organisms or systems of organisms, and inputs which have (suspected) mutagenic or carcinogenic properties must not be used.

If there are any risks, sufficient measures have to be taken to reduce any risks to an acceptable level and to prevent long lasting negative environmental effects.

Chemically Synthesised Products and Heavy Metals
Inputs should not contain harmful amounts of man made chemicals, ie products which do not occur in nature (xenobiotic products). Nature identical, chemically synthesised products are acceptable.

Mineral inputs should contain as little heavy metals as possible.

iv. **Human Health and Quality**

Human health
Inputs must not be harmful to human health. All stages during processing, use and degradation must be taken into account.

If there are any risks, measures have to be taken to reduce these to an acceptable level. Standards may be set especially for inputs used in organic production.

Product Quality
Inputs must not have negative effects on the quality of the product (eg taste, keeping quality, visual quality).

v. **Ethical Aspects - Animal Welfare**

Inputs must not have a negative influence on the natural behaviour or physical functioning of animals kept on the farm.

vi. **Social Economic Aspects**

Consumers Perception
Inputs should not meet resistance/opposition of (potential) consumers of organic products. An input might be considered by consumers to be unsafe to the environment, ecosystem or health, although this has not yet been scientifically proven. Inputs should not interfere with a general feeling/opinion about what is natural/organic, (eg genetically modified organisms).

c. NASAA Standards are made with reference to both 1. National Standards and 2. IFOAM Standards and in the future, after the passage of the Codex guidelines, will require to be made with reference to these also (although, presumably, the National Standards and IFOAM standards will have already done so).

The NASAA criteria for determining the suitability of substances for use in fertilising and conditioning are essentially those of IFOAM at present and in the current NASAA standards.

CLASSIFICATION OF INPUTS

The term "Input Product" means the substances used by the producer when growing produce that is to be certified.

There are four levels of classification as follows:

- **Recommended inputs**

  These substances are encouraged as good management practice.

- **Permitted inputs**

  These substances are allowed for use and will not prejudice certification.

- **Restricted inputs**

  These substances may be used with limitations on the purpose for which the product is used, the amount used, and the frequency or length of time they are used.

- **Prohibited inputs**

  These substances may not be used on certified farms.

d. **CODEX** Guidelines for the Production, Processing and Labelling of organically produced food.

These international guidelines are currently at stage 6 of the 8 stage process which would see them ushered in as international guidelines which would inevitably see determinations of international equivalence in part fall under their jurisdiction. It is anticipated that these guidelines would carry some weight with the WTO and therefore their inclusion as a factor for consideration of the future of an input product is of importance.

In relation to the criteria for the acceptance of input products the following passages have been accepted in principle by the CODEX meeting in Ottawa April 1997.

At least the following criteria should be used for the purpose of amending the permitted substance list referred to in section 4. These lists include products the use of which is established in organic agriculture, as well as new products which have to meet this criteria. Each input is necessary/essential and should be considered in the context in which the products will be used. Their use satisfies the principles of organic production as outlined in these guidelines. Available alternatives, including inputs which are already in use in organic production, should be evaluated.

(i) If they are used for fertilisation, soil conditioning purposes, they are essential for obtaining or maintaining the fertility of the soil or to fulfil specific nutrition requirements of crops, or specific soil conditioning and rotation purposes which cannot be satisfied by the practices included in Annex 1 or other products included in Table 2 of Annex 2; and, the ingredients will be of plant, animal, microbial, or mineral origin and may undergo the following processes:

-physical (eg, mechanical, thermal)
-enzymatic
-microbial: and
their use does not result in, or contribute to, unacceptable effects on, or contamination of, the environment, including soil organisms: and their use has no unacceptable effect on the quality and safety of the final product.

Note 2 of Annex 2, describes precautions in relation to the use of input products and states "Conditions for use of certain substances contained in the following lists may be specified by the inspection/certification body, eg volume, frequency, specific purposes etc".

2.5 SUMMARY

There are no significant restrictions placed on a bone/meat ash fraction by the regulatory mechanisms within the certified organic agricultural industry. Indeed, the product is accepted in general as meeting those criteria which would allow for its accepted use although clearly sole reliance on such a product would not be tolerated. Such a system which had sole reliance on a single input or single fertility enhancement mechanism would not be likely on a certified organic farm by definition.

There is no specific requirement for composting which is placed on bone/meat products.

Of significance possibly in the future, is the perspective that the organic certification/regulatory bodies may use when determining the suitability of the fowl manure and other intensive animal industry sources. A tightening of those criteria for acceptance by Australian certifiers in accordance with either international dictum or national perception may be the most significant factor of a regulatory nature to have effect on a bone/meat fertiliser, although this is not likely in the near future.

The absence of those fowl manure and other intensive animal manure sources would have a significant effect on fertiliser availability in many horticultural operations and provide an ideal environment in which alternative fertilisers, including bone/meat meal could be marketed.

Also of potential significance is the level of heavy metal permitted in phosphatic fertilisers. If this level cannot be reached by the phosphatic rock products, then a useful market niche may be developed by a bone/meat product.

3.1 SURVEY QUESTIONS

Name:
Location:
Crop/s:
Crop area: [up to 5ha] [5-10ha] [10-100ha] [100-1000ha] [Over 1000ha]
Fertiliser Products used:
Volume of each: [nil] [up to 5 tonne] [5-10tonne] [Over 10 tonne]

SURVEY METHODOLOGY

The survey was conducted over a period of three months through telephone and face to face meetings with the respondents who are certified with at least three organisations.

The results are less than random ones and are from a selection of growers from most of the major organic production sectors. A survey with any less than a cross section of sectors would provide results indicative of sectors alone and not of organic operators in general but significant patterns of use and non-use emerge.

SURVEY RESULTS

The 4 area divisions are almost equally represented with production areas up to 5ha, from 5-100ha, from 100-1000ha and over 1000ha.

The usage of fertilisers is divided into nil, 0-5 tonne per annum, from 5-10 tonne per annum and over 10 tonne per annum.

Fertiliser types are noted as

1. Compost
2. Blood and /or bone
3. Blends based on animal manures
4. RPR and Guano
5. Other minerals

	0-5 tonne per annum	**5-10 tonne per annum**	**Over 10 tone /annum**
Compost	5		2
Blood/Bone	3		
Animal manure blends	7	6	1
RPR	1	4	
Minerals			3

The results are very consistent with the author's own knowledge of fertiliser usage by organic farmers as a result of having conducted over 300 organic farm inspections in the last 5 years in Queensland, New South Wales, Victoria and South Australia. The patterns of usage revealed are a fairly representative window into the fertiliser usage within the industry.

SURVEY INFERENCES

Close to 50% of growers use some form of all purpose fertiliser blend which is the equivalent to an NPK product. (This figure is borne out again in Annex 6).

Currently only 10% of growers use a blood/bone mixture although this figure is probably a modest under-estimation (supported by Annex 6).

17% of growers use RPR but these are confined largely to Southern regions. (Annex 6 suggests less than this figure).

20% of 1000 growers use over 5 tonne of blended fertiliser per annum which equates to at least 1000 tonne.

Less than 40 growers use more than 10 tonne blended fertiliser per annum.

Assuming that the lower usage rates are in fact in the order of 1 tonne and that the 5-10 tonne rates are 5 tonne, then a total picture emerges of 1500 tonne per annum. This is a conservative interpretation of the statistics but is not necessarily inconsistent with observations in the field.

Significantly, there is no reported usage of fertiliser by all respondents on over 1000ha production areas. Small scale operators with up to 5 ha do not use any more than 5 tonne of any fertiliser per annum, whilst those with between 5 and 100 ha report the most significant fertiliser usage, although less than half of them use over 5 tonne of fertiliser other than lime or minerals per annum.

SURVEY CONCLUSIONS

In terms of organic industry sectors, there are three broad categories which are represented.

1. **Small growers with either no or no significant fertiliser purchase, with most requirements generated through waste material recycling. These are frequently less than 1 ha of actual certified production.**

2. **Medium sized horticultural and cropping sector with significant use of fertiliser as a major on-going fertility input.**

3. **Large cereal and livestock operators with nil usage of any fertiliser other than modest usage for starting of broadacre crops.**

The significance of these divisions is probably more to do with the potential to market a fertiliser into the organic sector than the intrinsic agronomic characteristics of the division.

a. **The small growers** include croppers of herbs, tropical and temperate fruit and vegetables. These growers have between .2 and 5 ha with most being towards the smaller end of the scale. They generally have minor levels of mechanisation and frequently produce their own compost. Their consumption of other fertiliser product typically includes less than 1 tonne/annum of bagged fertiliser and small volumes of liquid seaweed or other micro nutrient supplementation. They have some potential for growth in that these operations may be located within sections of much larger pastoral properties or in otherwise non intensive areas of agriculture. Growth, however, tends to be expressed in greater intensification more frequently than significant new area uptake.

b. This group is more limited in number than the former and perhaps represents 20% of the total certified organic operators in Australia. These operators are represented by **medium- sized grain growers, horticulturalists, vignerons, orchardists and dairy farmers.** These operators have annual incomes from between $20,000 pa to up to around $200,000. This is not to say that the total production is worth only $100,000, but the current sales as certified organic are only of this order.

This scenario is especially pertinent for grain growers who are joined largely by the livestock producers in being required to sell the majority of their product onto the conventional market. Whilst the horticultural sector does dispose of a portion of its organic certified commodity onto the conventional market, it is generally the case that most of this production is sold to the organic market making organic sales figures more closely correlated with total sales of all production.

It is this group which is most likely to be consumers of fertiliser inputs for the following reasons:

- The nature of horticulture requires more inputs than cropping and grazing.
- A significant portion of this group practice in areas of intrinsically poor soil such as the Sunraysia or portions of WA and are frequently on poorer soils in a district .
- The returns or certified organic horticultural product can be very good and fertiliser input costs are well covered.

- On reduced areas the medium-sized grain growers invest in fertility inputs to allow their smaller properties to reach economies of scale through improved production. The medium sized grain grower is frequently farming in more established districts with possibly 50-100 years of past production. These operators are more exposed to fertility decline than those many Queensland and lake-bed croppers who are farming on more recently cleared and more fertile soils.

c. If one examines category 3 which represents the **broadacre growers on 1000ha or more** who may be cropping an area this size or larger, there are some indicators of minor fertiliser usage only.

Many of these large growers are lake bed croppers following the ephemeral water and flood events to grow a variety of oilseeds in particular. These growers will probably never use fertiliser.

Another portion of this figure is made up of growers on the Darling Downs and other similar soil types where fertility is normally high and response to fertilisers of any type are minimal. It is unlikely that there will be any significant use of fertilisers in these locations. It remains to be seen how long this may continue.

Other large croppers are in the Balranald area where soil testing has indicated low response to fertiliser and where it is unlikely that fertiliser usage will be undertaken in the near future.

Within this category, however, there are some operators who are on soil types with nutrient deficiency (Central New South Wales and WA) where fertilisers are used as starters and where some minimal levels of application are seen as a necessary investment in long term fertility maintenance. It is unfortunate that even within many of these relatively depleted areas, current fertility maintenance is still questionable in the long term under organic management and within the affordability of the farmer.

The relationship of these two groups to the positioning of a bone/meat fertiliser will be examined later in this report.

3.2 THE CURRENT DIMENSIONS OF THE ORGANIC INDUSTRY

There have been two major studies made into the size of the organic industry in Australia over the past few years. In 1990 and 1996, Hassall and Associates conducted studies into the domestic market for Australian organic produce. The most recent of these revealed a domestic market worth in the vicinity of $80 million. This was despite the absence of the then major certified breakfast cereal producer, Uncle Toby's, which alone accounted for a significant portion of this figure. Their omission from the report suggests that figures are probably higher.

A further 1995 study, by Dumaesq and Green*, revealed the following:

Farm Type	% of Producers	% Farm Area	% of Organic Area
Broadacre	12	75	69
Horticulture	75	10	8
Livestock	10	12	17
Other	3	3	6

These figures have retained some relevance although broadacre production has tended to rise and livestock areas have risen dramatically with the entry of several large Western Queensland producers. For example, in June 1997, NASAA reports a total certified area of over 7 million hectares.

Farm gate sales of certified organic raw agricultural product can be crudely estimated from some of the industry levies payable. NASAA, for example, report in the last two years that the 1% levy payable is in the order of $190,000. This figure includes a 0.5% levy on processors also, with a ceiling of $10,000 on any single licensee although since the departure of Uncle Toby's from the ranks of certified processors, there are no current reports of any licences reaching the ceiling level. From within these figures, it is likely that approximately $20 million of certified raw material is produced with a much smaller level of certified processed material, including fertilisers.

There are, however, several factors which are thought to distort these figures and the reliability of the levy payment as a determinant of actual organic production.

Firstly, in the area of production, there is a general feeling that actual sales are in fact significantly smaller than total production levels.

1. The propensity to reduce levy payments through under-estimation of sales, but more importantly the portion which is disposed of to the conventional market. For some growers this figure can be 100% and frequently represents 25% of sales, even amongst horticulturalists.

2. The fact that many operators are dual certified, eg with NASAA and the BFA. It has been a policy until recently and may indeed still be a defacto policy that BFA sales need not be declared. In fact, despite having a reported 500 licensed growers a couple of years ago, BFA levy was under $40,000 based on 1% of sales. The opportunity for dual certified operators to claim that sales are made under an alternative logo and not pay that 1% levy is a well known phenomena.

3. In terms of processor levy, there are several significant processors who do not carry a certified organic logo and despite being certified and producing volumes of certified material, because they have no logo usage, there is no licence fee paid. The peculiarities of domestic food labelling regulations permit this to happen, although the incapacity of well-known certifiers to be able to accept the organic credentials of certain other organisations of certified growers is a further reason for the current situation.

With these factors taken into account, there may be production of the equivalent of a further 50% of organic product bringing the figure to a $30M equivalent.

The BFA could be expected to be more than this despite the historic absence of any mechanism to determine these figures.

The BDRI will not reveal under any circumstances what levels of production or processing are carried out by its members. It has never participated in market surveys and has not appeared in the Hassall studies. It may be speculated that its total production is perhaps less than half of the NASAA figure of $20 million, and this may be a generous figure.

OHGA has a high value product and that value can only be speculated but a $10 million value would probably be extremely generous.

OVA has really only begun to operate and is without any figures as yet. These are probably negligible at present but do have some potential.

In terms of farm gate and factory floor value, the total value of the organic industry is likely to be a little more than the $80 million quoted by the Hassall report last year and be around $100 million . Retail sales are far in excess of this figure .

Domestic

The current figures for domestic sales are assumed to be close to those reported by Hassall, but this very low figure is one which is only gradually growing. The prospects for domestic growth of the organic industry are uncertain and require a number of factors to come into play for significant growth to be likely. There are currently several major impediments to the growth of the domestic organic industry which are as follows:

1. Low levels of production especially in the horticultural area .
2. Low number of processing operations especially for horticultural products.
3. Limited uptake of organic commodities by supermarket chains.
4. Limited understanding of availability from domestic consumers.
5. Absence of domestic regulations.(ANZFA)

These factors combine to create a circle of restraint which may find its solution only through an export-driven expansion.

Export

There have been no studies or surveys of the nature and value of exported certified organic product in particular, although under the administrative arrangements in place in conjunction between certifiers and AQIS, there is supposed to be a mandatory documentation process for all organic exports. This has not always been happening and therefore only an incomplete level of documentation is retained by each of the certifiers. These documents are not only incomplete but are of a confidential nature and may not be revealed to outside scrutiny, but it is clear that there is a very significant level of export of a range of Australian certified organic commodities. These commodities range from essential oils, (T Tree), hard wheat, oats, rice, wool, oilseed and oils, apples, citrus, wine, mixed vegetables and minor herb, meat and dairy products.

There are no exact figures available for export volumes or for export value and the estimate that approximately 25% of all organic products (both raw material and processed product) leaves as export goods is probably conservative. The seemingly incongruous situation in the horticultural arena where significant export potential remains unrealised, whilst domestic over-production of many commodities is a reality is in the nexus between the relatively low volumes capable of being handled by the small domestic retail sector and the huge step required to service most export requirements. The export of horticultural commodities is carried out by only a couple of committed traders in Europe and a few more in South East Asia. The Japanese inquiry comes from a number of major Japanese buying/retailing houses who scour the country on a regular basis searching for raw and processed materials.

3.3 GROWTH POTENTIAL IN THE ORGANIC SECTOR

The domestic market growth potential will be determined by the above factors discussed. With the recent formation of the Organic Federation of Australia (OFA) and the beginnings of some Government support for R & D, promotions and single logo marketing, some further steps may soon be taken to raise domestic public awareness of organic foods. Campaigns to raise general awareness are still probably premature in the absence of a significant or steady supply of most commodities. Some increased level of interest is being noted with a major food processor, Heinz, having decided to include an organic line in its babyfood sector. Coles Supermarkets continue to show interest and have had buying agents visit most significant organic producers in the south east of

Australia. With all of the interest that has been shown, it remains uncertain if domestic production will greatly accelerate over the next 5 years of its own accord. Domestic growth in the organic industry will most likely be driven by the growth in the export sector or processing sector when economies of scale and scope developed within that environment are transferred across to the domestic sector.

The export market opportunities are seemingly huge ones with orders for horticultural produce in particular, far outstripping supply. NASAA has attended several major international organic food/fibre trade shows (Biofach in Germany for the past three years, The IFOAM Trade Fair in Copenhagen and Foodex in Japan) and directly witnessed the enormous demand for certified organic product. Whilst price is an issue and one which is important when one considers the current competition from Argentina and other South American countries and the potential for Africa to compete in the future, the quality of Australian organic product appears to be of the highest order and has thus far demonstrated that it is competitive.

Those countries which are demonstrably good export markets are chiefly the current members of the EU, in addition to Switzerland, Japan and other South East Asian countries with relatively wealthy elites which include portions of China. By far the most substantial inquiry and interest comes from the EU and Japan, whose requirements are known to be on-going and almost always unmet by Australian suppliers.

The demand from the EU is a constant one for certified organic produce and in countries like the UK, where organic production is growing by 30% pa and Germany where there are over 20,000 certified organic farmers, the likelihood of on-going demand is good. Consumers in those countries appear to have a sophisticated requirement and with the BSE situation in the UK, organic demand appears to have consolidated in recent times, especially for organic meat which has yet to have been demonstrated to have had BSE. Furopean consumers are seemingly aware of certified organic and EEC standards are well developed and have influence on all standards throughout the world. Consumers appear to be less confused by green and clean claims which carry less weight in that trading environment.

Japanese demand appears to be greater in volume, but more idiosyncratic and on the surface at least, more exacting. Considerable disenchantment has been shown by certain Australian organic producers for the specifications and short-term requirements of the Japanese buyers. There has been less interest historically by the Japanese for certified organic product with food safety being the main reason for interest. With the articulation of Japanese organic standards to the Australian certification community this year, however, it appears that the concept of certified organic is becoming more consolidated in the Japanese organic buying culture. Although it may be some time before the ecological dimension of organic farming (so well and truly recognised by the EU) becomes a topic understood by the Japanese, it is true that Japanese retailers now demand organic certification for any products purporting to be organic.

The South East Asian demand is for fresh seasonal vegetables and fruit which are shipped into those countries and which has been suggested will grow in time, but with the current recession in many of those economies, the niche markets may remain just that with some limitations on the growth of those sectors although only modest growth will place substantial pressure on current supply in the absence of growth in the Australian sector.

Unfilled Orders

Those areas displaying substantial and usually unmet demand from the above categories include the following:

1. Fruit (temperate and tropical)
2. Mixed vegetables with the exception of potatoes
3. Durham wheat and products
4. Grain legumes
5. Rice
6. Dairy Products
7. Wine
8. Coffee and spices
9. A wide range of processed foods

The oilseed industry is one which appears to have been able to meet a portion of the international demand, and although safflower and sunflower and, to a certain extent, canola has been satisfactorily met, linseed and other more exotic oils are dramatically under-supplied. Strong competition from Argentina is seen in this area.

A growing demand from organic noodles is also being met by Australian growers, flour-makers and Japanese manufacturers in Australia. The requirement for usually at least 9.5% protein wheat rules out many production areas and limits others. It is true that there is excellent high protein wheat produced by Australian growers and this flows largely from Central New South Wales to Southern Queensland.

Currently there are on-going exports of apples and citrus, in particular, with minor other fruit. The organic wine producers other than small scale operators export almost the entire production to an insatiable market.

Rice exports are currently limited by production with only a handful of rice growers from the MIA. Premiums of $80 per tonne have failed to entice a larger number of growers despite an advanced state of research and methodology in organic rice culture. Those portions produced are eagerly sought by Japanese and several new varieties of Japanese preferred rice are being grown .

Vegetable production, especially onions and brassicas, have a high international demand and there are several hundred, if not several thousand, hectares required to begin to meet demand.

Fruit juices have seen great demand, although carrot juice has gone out of favour it would seem.

Sugar has been a commodity in high demand both domestically and internationally. There is currently only limited supply of beet sugar from the US. Impediments to organic sugar production lie in processing rather than production

The supply of soft and low protein wheat appears to outstrip demand.

Immediate Possibilities

Most likely scenarios for immediate growth in the export sector include the general area of horticulture which includes the vegetable row cropping sector and the pome fruits. Vegetable processing for the export and domestic market for products such as carrots, spinach, broccoli and tomatoes shows some promise.

The increased demand for specific wheat varieties is also an immediate future prospect especially for noodles.

Rice production has been limited by effective weed control in the long term and may have been limited by phosphorous replacement strategies, although RPR is seemingly applicable under the high moisture levels and high biological activity within rice rotations.

Beef export markets for organic product are being developed and may come to fruition in the next two years.

Wool export has picked up and demand promises to be substantial .

Therapeutic organic oils (ie Melaleuca) export is growing dramatically.

There are many other areas for potential growth, but there are frequently other limiting factors such as agronomic practice development and transferability which would affect the uptake of tropical fruit and expanded tropical horticulture in general with its greater demands on pest and disease control. This includes a strong demand for grain legumes which are still in the high risk category from heliothis attack.

Processing impediments tend to place some immediate limitations on potential growth in other sectors.

Will the Organic Market Endure and Retain its Character?

There has been a general reaction by the food production and processing sector throughout the world to "clean up" and present a "green" image to the world.

The National and International regulators are requiring more quality assurance in areas including product specification, microbiological and chemical food safety and environmental production criteria.

The ANZFA has demanded that "Paddock to Plate" ISO and HACCP based systems be put into place in Australia. Many individual operators already have ISO 9000 and 14000 production systems and the question is often asked "will organic agriculture endure?"

Only the future will tell, but there are several factors which must be considered which suggest that organic agriculture will endure, but may see its form altered in the future.

a. The embrace of organic agriculture by the US Academy of Science.
b. The uptake of Organic Standards by Codex
c. The strength of the NGO movement in organic agriculture.
d. The demand by European consumers in particular.
e. The recognition by Japan of certified organic.
f. The production and positioning by global competitors in servicing the organic sector.
g. The national recognition of the market by most nations (eg, EU, US, Argentina)

It is precisely through the uptake of organic parameters by Government and business, that some alterations may be seen in the form in which it takes in the future. Most likely it will be expressed by the following:

a. Greater homogeneity and some dilution/rationalisation of standards. For example, already the EU and the US have prevailed over certain areas of relaxation of criteria in comparison with Australia. The current Organic Food Production Act under consideration in the US is reported to be expected to "redefine" organic practices in certain areas such as permitting genetically modified organisms. Such an Act is the antithesis of that which is considered to be organic at present.

b. A number of NGO groups and private marketing cartels may reposition themselves from their current organic status and create independent Eco labels but the mainstream should remain defined as organic.

c. Mechanisms for verification of the certified organic status of operators may change to conform more with formal quality management schemes and Government and Government agencies may become more responsible for verification, which can be seen in the US and the EU.

d. In the face of institutionalised organic standards, the essential criteria requiring absence of poisons and artificial fertilisers, and an ecological production system will become the basis of a global organic industry. Food safety and environmental production will be characterised by "Certified Organic". Best management practices in a broad range of areas will likely find their way into this niche, as they already have, and competing "Clean and Green" marketing or other ECO labelling will most likely be marginalised. Major agribusiness and chemical institutions will probably accelerate their uptake of biotechnological R & D and depending on resolution of the question of GMOs in organic agriculture, will increase their stake in the organic industry.

The inferences are that organic agriculture is here to stay and should be factored into the planning strategy of any participant in agriculture beyond 2000.

3.4 OPPORTUNITIES FOR MARKETING A BONE/MEAT MEAL FERTILISER

There are fertiliser replacement requirements in two major sectors which will be of significance as growth potential is realised. These are broadly in horticulture and grain production.

Horticulture in general has a high requirement for fertility inputs especially N and is currently paying a high price for N and P (see section 1).

Grain (including oilseeds, pulses and rice) production is currently a minimal to non-existent user of fertiliser, but with on-going demand and likely growth, will require affordable and available P in addition to N. The capacity for a bone/meat fertiliser to provide a significant portion of this need is realisable.

3.5 METHODS OF APPLICATION USED BY ORGANIC FARMERS.

Across the spectrum of organic farming activities lies the full range of application methodologies. These vary from the use of air seeders on broadacre grain farms, through to a variety of spinners and band applicators to a variety of "honey wagon" technologies, including trailers and spades.

Most of the equipment designed for conventional and usually higher analysis fertilisers have some limits on the volumes which may be applied especially in row cropping. However, there is a generally compatible technology available in most fields of organic farming to accommodate the granulated fertilisers in particular and with some limitations, the pelletised and mineral fines fertilisers.

Frequently, machinery for spreading fowl manure is used for compost spreading and spinning disc spreaders used for RPR and other minerals.

The use of machines for banding whether they be for cereals or for rowcropping are preferred for several reasons.

a. The relatively high cost of fertilisers and the need to be site specific.
b. The desire not to fertilise unwanted weeds which are more frequently present in the organic system .
c. The availability of the machinery.
d. The desire to avoid dustiness with impact on worker safety, environmental impact and efficiency of use.

3.6 PHYSICAL CHARACTERISTICS OF A FERTILISER

The physical properties of existing organic solid fertilisers can be summarised by at least 5 major categories

i Granulated (eg Guano, Fertico, Vicmill)

ii Pelletised (eg Dynamic Lifter,Terra Firma, Neutrog)

iii Mineral fines (eg Jordanian and Carolinian RPR, limes, dolomites and basalts etc)

iv Dusts (Hard RPR, potash lime, blood meal)

v Composts (eg Rockdale)

The physical properties of a fertiliser should be such that maximum versatility is obtained in the application options and that greatest overall ease of handling and application is achieved.

- **Granules** With ease of application as discussed and greater bulk density these are also often seen as more classical "fertilisers" as they largely behave as many conventional mixes with good running characteristics achieved through consistency and moisture content. The disadvantage is dust which can present losses on windy days and some operator and environmental impact.

- **Pelletised** The pelletised products with satisfactorily completed composting and regulated moisture content can and do feed through most machinery fairly effectively, although grain combines are reported to be less than efficient with some products and smaller sized pellets have been favoured by some operators. Even in large fertiliser application technology such as potato planters, pelletised fertilisers can be problematic and under certain conditions will not run smoothly, building up walls and hollows within bins reflecting the high co-efficient of friction within the material. Uptake of moisture can be a problem with many fertilisers and this can be especially so with many pelletised products. Low dust levels are common although not guaranteed and the capacity to spread with spinners or other similar devices is probably improved. These are perceived as the "original" types of commercial organic fertilisers.

- **Mineral Fines** These are a very generic group and include some variation in consistency but they are usually less compatible with many spreading devices used with granules although not always. Air seeders are reported to be less than compatible with many of these materials and some older machines have difficulty with the fine Carolinian rocks which run like sand in an hour glass. Most require dispatch with a belt and spinner. Reactive rock phosphate blends are frequently sown with cereal through combines although the merits of this form of application for immediate crop response purposes is questionable.

- **Dusts** Very fine materials sometimes used in organic farming include milled dusts including rock phosphate and the burnt limes. Blood and bone could be crudely described as a dust with its light powdery component but generally behaves more closely to the granules. Dusts are problematic in spreading except through belts and spinners but are also prone to serious loss to wind. Moisture differentials can play havoc with physical characteristics.

- **Composts.** These require specific equipment for handling and spreading and can be spread with relatively crude to most sophisticated devices. There is usually a minimum of this equipment in the hands of other than horticulturalists although custom spreading services are sometimes available.

Summary

A physical characteristic of a fertiliser needs to be one which can be handled and spread easily. Very fine materials are both physically problematic to spread and present risks to workers and handlers. (Unions handling a milled Rock Phosphate in Geelong some years ago placed limits on handling the material and supply was affected). Pelletised products are moderately easy to handle and well accepted by the organic farmer. The granules are superior in terms of handling and spreading with many similar characteristics to the conventional fertilisers and are seen as more concentrated and should be considered as a superior option in a fertiliser development program for a bone/meat fraction.

Special attention should be paid to product uniformity and freedom from foreign objects. The process of composting and the use of a variety of sources of animal manure can see objects enter the mixes of some products, despite screening. These are very problematic in maintaining consistency with banding application devices.

A further contaminant is labels which fall off after the bag is opened, entering the fertiliser box and causing blockages.

An important physical dimension of the fertiliser package is the nature of securing the bag container. Sewing with machinery which enables easy location of string ends and easy opening of bags enables cutting of bags to be avoided for recycling.

3.7 CHEMICAL CHARACTERISTICS OF A FERTILISER

There are three different approaches to providing an organic fertiliser:

i. What you see is what you get. The intrinsic characteristics of the material are unmodified and provided that fertiliser law is satisfied, they become the known characteristics of the material.

ii. A generic blend which adds some necessary macronutrient and micronutrients.

iii. Custom blends.

- The characteristics of the bone/meat product are significant with good levels of P an N and Ca. These alone provide an important fertility base and will be of great relevance to many growers especially those who may be using other solid or liquid fertilisers such as in horticulture.

- The generic blend which for bone/meat meal would require the addition of Potassium, Sulphur and some trace elements has the potential to provide a "complete" organic fertiliser.

- The custom blends are a reality in the organic sector and require a good agronomic service in tandem with the fertiliser supply. The achievement of custom blends is more demanding than the above two options.

As discussed in Section 1, there are reasons for a blended fertiliser although clearly there is no universal blend. The capacity to provide blended fertilisers has several major advantages.

- The capacity to meet a wider range of fertility requirements.
- The capacity to provide a one stop shop for the fertiliser user
- The capacity to make nutrient additions in order to satisfy the requirements of fertiliser labelling law.
- The capacity to prepare the fertiliser to meet desirable physical characteristics.

Summary

The option to create a blend is a compelling one for the utilisation of a bone/meat fraction. The need to modify the physical characteristics in the product in line with the discussion in an earlier section are of importance. The addition of a Potassium and Sulphur component will be of use with the generally on-going requirement for these elements in addition to trace elements such as Copper, Molybdenum, Manganese, Boron and Zinc. There is provision under the organic farming standards to make additions of those major and trace elements.

3.8 DISTRIBUTION OPTIONS

Currently, organic fertilisers are supplied through a wide range of outlets. These include the following:

i Stock and station agents, (eg Elders)

ii Speciality organic suppliers, (eg Goldfields Organics)

iii Hardware and rural produce merchants

iv Direct from manufacturer

v Major fertiliser companies (eg Pivot)

vi Custom supply/spreading agents

- **Stock and Station Agents** These have advantages in that they are located in most (although dwindling) districts and at least all major outlets have a significant exposure to the buying public. The range of fertilisers on hand is frequently limited to the "specialty" types such as bagged organic or organically based fertilisers. There is frequently a need to order in advance however, as only limited stocks are kept on hand. Buying direct from the manufacturer will often be more rapid and depending on the volume bought, may be more competitive. Staff will usually have no specific knowledge of the product and be able to offer little or no advice.

- **Speciality Organic Suppliers** These are often dealers in a range of organic input requirements such as foliar sprays and botanical pesticides but may also deal in conventional agricultural products. They do not commonly have the capacity to hold any significant reserves of product and usually require advance notice. They have the capacity to provide good information and may have a core of organic growers which they service. Exposure to the mainstream fertiliser buyer is usually more limited although not entirely so, as there is evidence that conventional growers are beginning to show an interest in organic fertilisers from the viewpoint of efficacy. Prices can be high.

- **Hardware and Rural Produce Merchants** These have very high exposure to the general public which frequently includes the organic farmer. They are usually carrying limited stocks of some organic fertiliser at present and have some rapport quite frequently with the customer. They too, have limited capacity to carry stock, but have demonstrated that they are prepared to meet this demand and have staff which are prepared to assist with information, generic as it may be. Frequently, mark-ups can be excessive.

- **Direct from Manufacturer** This method is a quite commonly used one in the organic sector. The information on the product can be supplied with accuracy and prices can be directly established. Transport is not uncommonly just as easily arranged by the buyer than an agent and delivery is to the farm. The perception that the price is a good one as a result of direct marketing makes this an attractive option for many farmers. In fact, the perception is in most cases an accurate one as mark-ups along the line can make already expensive organic fertilisers exorbitant.

- **Major Fertiliser Manufacturers** These already carry some organic lines and have the obvious advantages of a sophisticated distribution network and handling facilities for bulk product. They are potentially able to provide good information in concert with agronomic advice arising from soil or tissue testing. The capacity to arrange for spreading is also significant. There may be issues of prejudice however, and the commitment of the company and its officers to the product would need to be established.

- **Custom Spreaders and Handlers** These are commonly major fertiliser suppliers and have access to a range of products, both conventional and organic. By offering the spreading service they have a distinct leverage in terms of sales and because they are large/bulk handlers, and often spread at a very competitive price.

Summary

The above options all have merit and it is not uncommon to see certain products distributed through more than one of the above methods. Usually, franchise arrangements are made and areas are divided up and distributors given some exclusive distribution rights, although one must wonder sometimes upon what sort of agreements are made and kept in this arena. Depending on the level of penetration which might be anticipated into the conventional market, the distribution methodology will vary.

If one could expect to find significant clients amongst the conventional sector, then distribution through a major fertiliser chain will be of merit, as there is obviously a potential level of exposure which would not be present through a more eclectic distribution pathway.

If the target is to be the alternative organic farmer, then there may be some resistance (limited) to buying through the conventional sector.

Given the still limited volumes of fertiliser used by the organic sector and the fact that large distributors have already embraced a number of organic products (pelletised manures, rock phosphates and other minerals), there would be a distinct advantage in attempting to establish a distribution chain through an established fertiliser company.

3.9 MARKETING AND PROMOTION

Clearly, the volumes of material used by organic farmers are still relatively low and any marketing and promotional exercise should be aimed at further groups to currently certified organic farmers.

These other groups are those non-certified organic farmers (which are few) and those farmers who are contemplating farming organically. A further group are those farmers who are finding that response from existing conventional fertilisers on their farms, for whatever reasons, are becoming limited.

a. **Certified Organic Farmers** The message for this market should be of several dimensions.
- The product is efficacious and provides valuable nutrients.
- The product is approved or certified.*
- The product has an ecological dimension. ie recycling of animal waste to the land from whence it came.

b. **Farmers considering certification.** The message should be:
- The product is a suitable replacement for their current fertiliser
- The product is certified and represents a legitimate step towards entry to organic farming
- The product is natural

c. **Conventional Farmers.** The message should be that:
- The product is a balanced fertiliser with a range of nutrients
- The product is natural

The combination of these factors in a marketing campaign could be achieved through certification of a supplemented granulated product which emphasises:

- The valuable P content
- The valuable N content
- The valuable Ca content
- The natural composition of the fertiliser

- The bones and the return of these to the land, thus closing the cycle of nutrient so often lost from the land.

* Certification and approval of fertilisers can be obtained through a number of certification organisations. The process of certification involves on-site inspections on an annual basis and a 0.5% levy on sales. Approval requires a desk audit, an annual fee of around $150 and inclusion on an approved list.

The criteria for acceptance into either of these categories as discussed in section 2 are deemed satisfied.

3.10 SUMMARY

a. The bone/meat fraction has a legitimate role in certified organic agriculture.

b. The bone/meat fraction is acceptable under organic farming standards.

c. The bone/meat fraction is competitive with existing fertilisers in use in organic agriculture.

d. The current market for a bone/meat fraction in **organic** agriculture would need to be carved out of the following estimated current usage which is considerably less than some previous estimates although it appears that significant uptake of pelletised animal manure products in particular by the conventional agricultural sector, presents a potential market niche which cannot be ignored.

• Compost	20,345 tonne
• Animal Manure Based	1,845 tonne
• Animal Waste Products	584 tonne
• RPR and Guano	1,190 tonne
• Minerals and dusts	7,338 tonne

The bone/meat fraction will compete indirectly with 1 and 5, (composts and mineral dusts) and more directly with 2, 3 and 4 (animal manures, B&B, RPR and guano). These make up a little over 10% of estimated total solid fertiliser use with approximately 3000 tonne.

e. Fertiliser replacement will be based on criteria discussed in Section 1. The bone/meat fraction has the capacity to exploit a variety of current product niches.

- *Compost* Less than likely to be significant.
- *Animal manure based* Highly likely, depending on blend.
- *Animal waste product* Complemented
- *RPR and guano* Highly likely, especially with N content.

- *Mineral and dusts* Low likelihood

f. The trace element composition of a bone/meat fraction is valuable and favourable for the organic farmer who, farming in a more limited macro nutrient regime, is especially reliant on an enhanced spectrum of micronutrients

g. Of importance is the calcium and magnesium component which assists with providing a useful balance for the organic farmer. The product also supplies an important Mg component for organic livestock farmers who have long recognised this element in its role in the prevention of serious metabolic disorders in livestock.

ANNEX 1 ORGANIC FERTILISER SPECIFICATIONS AND PRICES

ANIMAL MANURE BASED PRODUCT	N	P	K	$/tonne
DYNAMIC LIFTER				
Standard Mix	3	2	5	$ 375.00
Blood & Bone Blend	4	3	1	$ 500.00
LOng Life with B&B and Fish	4	3	1	$ 425.00
TERRA FIRMA				
Organic Life	4	3	2	$ 395.00
NEUTROG				
Nuetrog Organic Fertiliser	3	2	1.7	$ 306.00
Neutrog Rapid Raiser with added B&B	5	3	1.5	$ 356.00
FERTICO				
Composted Oganic fertiliser	3	4	2	$ 297.00
Composted Fish Fertiliser	4.5	3	2	$ 328.00
Composted Blood'n'Bone Blend	5	5	0.5	$ 308.00
GROW-WELL	3	2.5	2	$ 425.00
DIAMANTINA ORGANIC FERTILISER	4.5	3	2.5	
ORGANOTECH				
Fish Fert.	4	3	2	$ 295.00
Organic Phos	1	7	3	$ 260.00
Organic Plus	2	4	2	$ 245.00
Sulphur Phos	0	4	2	$ 205.00
ANIMAL WASTE BASED PRODUCTS				
PIVOT BLOOD & BONE	5	5		$ 458.00
NEUTROG BLOOD & BONE	5	5		$ 431.00
VICMILL BLOOD & BONE BLEND	5	5		$ 410.00
ORGANOTECH BLOOD & BONE	5	5		$ 375.00
MINERAL OR MINERAL BASED PRODUCTS				
PIVOT RPR	14			$ 220.00
Jordanian RPR	14			$ 280.00
Various Sources of Middle East and Carolina rock	14			$ 225.00

	N	P	K	$/tonne
GUANO AUSTRALIA	0-5	12		$ 450.00
VICMILL FERTILISERS				
Complete Organic Fertiliser	3.2	3.2	3.3	$ 355.00
Pasture	2.1	2	0.8	$ 231.00
Magnaphos	1.7	3.7	1.2	$ 285.00
PSK		4.5	4.3	$ 333.00
ECO MIN Rock Dust			2.5	$ 130.00
ORGANOTECH 5% Rock Phosphate	0	5	0	$ 125.00

COMPOSTED MANURES WITHOUT SPECIAL TREATMENTS

	N	P	K	$/tonne
ROCKDALE BEEF COMPOST	2	1	2	$ 9.00
FIN P/L Composted manure,fish and vegetable products	2	1	2	$ 60.00
PERMAFERT digested pig manure slurry	1	1	1	$ 100.00
WIMMERA WOOL PROCESSORS (Composted milled dags)				
ORGANOTECH COMPOST				$ 140.00

LIQUID FERTILISERS

	N	P	K	$/tonne
VICMILL Fiskel fish, seaweed and trace elements	2.2	0.6	0.9	
Gro Natural Fish Emulsion				
Humilac soil and compost activator				
Maxicrop 100 Liquid Seaweed Plant food				
Vitec Fish Fertiliser	2.8	0.7	0.6	
Moeco P/L "29 Fruit and Flower"	0.8	0.5	20	

ANNEX 2 SOME COMPARISONS OF ORGANIC FERTILISERS

ANIMAL MANURE PRODUCT	4. Cdt'ing	5.Availability	6.Extras	7. Other	8. Access
DYNAMIC LIFTER					
Standard Mix	2	5	2	0	5
Blood & Bone Blend	1	4	3	0	4
Long Life with B&B and Fish	2	5	4	0	4
TERRA FIRMA					
Organic Life	2	5	2	0	4
NEUTROG					
Nuetrog Organic Fertiliser	2	5	2	0	4
Neutrog Rapid Raiser with added B&B	2	4	3	0	4
FERTICO					
Composted Oganic fertiliser	2	5	2	0	4
Composted Fish Fertiliser	3	5	3	0	3
Composted Blood'n'Bone Blend	2	4	3	0	3
GROW-WELL	2	5	2	0	3
DIAMANTINA ORGANIC FERTILISER	3	4	2	0	1
ORGANOTECH Fish	3	5	3	0	3
ANIMAL WASTE PRODUCT					
PIVOT BLOOD & BONE	1	4	1	0	5
NEUTROG BLOOD & BONE	1	4	1	0	4
VICMILL BLOOD & BONE BLEND	1	4	1	0	3
MINERAL BASED PRODUCT					
PIVOT RPR	0	2	1	0	5
Jordanian RPR	0	2	2	0	3
Various sources of RPR					
GUANO AUSTRALIA	0	3	3	0	3

	4. Cdt'ing	5.Availability	6.Extras	7. Other	8. Access
VICMILL FERTILISERS					
Complete Organic Fertiliser	0	4	4	0	3
Pasture	0	3	3	0	3
Magnaphos	0	3	3	0	3
PSK	0	3	4	0	3
ECO MIN Rock Dust	0	3	2	4	2

COMPOSTS & CONDITIONERS

ROCKDALE BEEF COMPOST	5	3	3	0	3
FIN P/L	5	3	3	0	2
PERMAFERT	4	3	3	0	2
WIMMERA WOOL PROCESSORS	5	3	3	0	1
Organotech Compost	5	3	3	0	2

ANNEX 3

An organic farmers experience with RPR

Area treated per annum	4ha
Rate of Application	1.5t/ha
Time of Application	6-8 months before crop maturity
Crops	Potatoes
Other fertilisers	3t/ha lime, 1.5t/ha of 3:2:2 manure fertiliser
Yields	30 to 60 t/ha of potatoes depending on varieties Up to 30 bags/acre of wheat one year later .

The following results represent an average or range of 13 samples

Soils	
Particle size	Clay 35%, Silt 32%,Fine sand 27%, Coarse sand Exchangeable
Cations	
CEC	25
Ca (cmolc/Kg)	6-12
Mg	2.5
K	1.3
Na	0.5
% Base	47
ESP	2.5
SKENE K mg/Kg	250
OLSEN P mg/Kg	7.7 to 9.3
Ph (Water)	6.1
Ph (CaCl2)	5.1
EC 1:5	0.09
TSS mg/Kg	245-328
Bulk Density (g/cc)	1.28

The following results were gathered on a weekly basis for a period of 7 weeks

Soil temp deg C	8-14
Earthworms/sq m	0-689 (250mean)
Microbial Respiration	
gCO2/g/s	6.2E-10
Organic Matter %	6.6

ANNEX 4

ORGANIC REGULATORY REQUIREMENTS FOR PELLETISED MANURE DERIVED PRODUCTS.

The requirement to compost all non organic animal manures under the national and individual certification organisations adds a further dimension to the processing requirements of "organic manure inputs".

The composting process may be aerobic or anaerobic but is almost always the former. A significant exception is the Charles EFI Corporation based near Ballarat, Victoria, which produces high quality, anaerobically composted pig manure after methane extraction.

The principles of composting are best described as a method by which humus is generated from a range of organic materials.

The practices, however, tend to vary throughout the industry and provide much fuel for debate on preferred methodologies. In the field, and on farms, a range of techniques from highly sophisticated to very average exist, but in the processing sector there is less variation. Material is, however, often seen to be less composted than purists and indeed average practitioners would expect. There are various reasons why less than complete composting is sometimes seen in the bagged fertiliser industry.

Enhanced energy content in the form of undigested protein and carbohydrate capable of feeding microbial growth .

More free nitrogen in the form of ammonium, nitrite and nitrate.

Time period required for complete composting.

Quality assurance in the face of varied climatic and environmental conditions.

The bagged manure based products are generally tolerated by certifiers and only in the rarest of circumstances would they not be acceptable.

With certain European certifiers now prohibiting manure from "Factory Farms", and a substantial proportion of Codex delegates supporting this position, the future may reveal some emerging barriers to the use of certain portions of the Australian fowl manure stockpile for use in certified organic systems.

ANNEX 5
ACTUAL SOLID FERTILISER USE FOR A SELECTION (71) OF ORGANIC FARMERS (1996-97)

CROP/S	FERTILISER	VOLUME
Vegetables	Dynamic Lifter B&B	7.5tonne
Vegetables	Lime	200kg
Grain	COF	28 tonne
Mangos	Compost	90 tonne
Macadamia	Alroc	1 tonne
	Compost	25 tonne
Avocados	Alroc	3 tonne
Grain	Guano	50 tonne
	Rockdale Compost	120 tonne
Apples	COF	1.7 tonne
Citrus	Compost	500 tonne
Bananas	Compost	5 tonne
Vegetables	Dynamic Lifter	100 kg
Stone fruit	Blood and Bone	200 kg
	Compost	50 tonne
Citrus	Dynamic Lifter	2 tonne
Vegetables/Fruit	Organic Life	1.4 tonne
	Blood meal	100 kg
	Compost	2 tonne
Bananas	Organic Life	3 tonne
	Natra Min	2 tonne
Citrus	Meat and Bone meal	250 kg
Bananas/Avocados	Meat meal	1 tonne
	Alroc	1 tonne
	Dynamic Lifter	1 tonne
Berries	Dynamic Lifter	1 tonne
	Dolomite	1 tonne
	Compost	25 tonne
Broccoli	Blood and Bone	30 tonne
	Dolomite	10 tonne
Vegetables	Thunderbolt	4 tonne
	Guano	1.5 tonne
	COF	5 tonne
	Organic Life	5 tonne
Vegetables	Compost	5 tonne
Vegetables	Compost	45 tonne
Bananas	Alroc	40 kg
	Dynamic Lifter	6 bags
Apples	Nil	
Vegetables	Vicmill	1 tonne
Grain	RPR	24 tonne
	Lime	25 tonne

CROP/S	FERTILISER	VOLUME
Dairy	Basalt	40 tonne
Apples	Guano	500 kg
Stone fruit/Vegetables	Fertico	200 kg
	Compost	500 kg
Apples	Compost	100 tonne
Grain	Organotech	14 tonne
	Gypsum	60 tonne
	Dolomite	10 tonne
Grain/Beef/Sheep	RPR	14 tonne
	Guano	600 kg

The above table represents a cross section of NASAA certified growers and information is supplied by NASAA. The information is derived from annual returns for the 1996/7 financial year.

NOTES: Compost refers to homemade compost except where stated otherwise.

No reference to liquid fertilisers is made in the above table but it must be pointed out that there is widespread use of liquid fertilisers used as foliar applications. These are principally seaweed and fish-based fertilisers which are used commonly for their trace element content and unspecified growth promoting qualities.

The rates and mix of usage is consistent with the survey of Annex 5 and suggests that rates of usage of the various bagged fertilisers including animal manure based products and the TRPR products are probably around 3500 tonne /annum

From 71 growers selected at random, the following fertiliser products were used.
1444.5 tonne compost
131.05 tonne bagged animal based manure
41.45 tonne animal waste products
84.5 tonne RPR and Guano
521 tonne minerals and dusts

To extrapolate to the estimated 1000 organic growers in Australia, the following figures emerge.

COMPOST	20,345 tonne
BAGGED ANIMAL MANURE BASED	1,845 tonne
ANIMAL WASTE PRODUCTS	584 tonne
RPR AND GUANO	1,190 tonne
MINERALS & DUSTS	7,338 tonne

CROP/S	FERTILISER	VOLUME
	Gypsum	50 tonne
Vegetables	B&B	2 bags
Wine grapes	Nil	
Apples	COF	1 tonne
Vegetables	Neutrog/Organic Life	750 kg
	Compost	1 tonne
Grain	Gypsum/dolomite/lime	300 tonne
Herbs	Dolomite	100 kg
Vegetables	Organic Life	10 tonne
Apples	Basalt Dust	2 tonne
Sheep	Vicmill Humaphos	11 tonne
Herbs	Nil	
Apples	Basalt dust	6 tonne
	Dynamic Lifter	560 kg
Vegetables	Dynamic Lifter	2 tonne
Avocadoes	Organic Life	.5 tonne
Bananas	RPR	200 kg
	LIME	10 tonne
Vegetables	Compost	20 tonne
	Dolomite	4 tonne
Grain	Nil	
Fruit/Vegetables	Organic Life	1.5 tonne
Vegetables	Organic life	240 kg
Grain	Nil	
Paw Paw	Dymanic Lifter	1 tonne
Grain	Nil	
Paw Paw	Nil	
Mixed Fruit	Nil	
Dairy	Compost	200 tonne
Poultry	VicMill	500 kg
Apples	RPR	500 kg
	Organic Life	200 kg
Vegetables	Organic Life	5 tonne
Citrus	Chicken manure compost	80 tonne
	RPR	6 tonne
	Potassium Sulphate	3 tonne(via compost)
Potatoes	Organic life	10 tonne
Vegetables	COF	2 tonne
	Compost	50 tonne
Citrus/Vines	Compost	25 tonne
	VicMill Humaphos	5 tonne
Vegetables	Organic Life	2 tonne
	Jomoco Fish	.2 tonne
Beef/Sheep	Guano	3 tonne
	COF	300 kg
	Humaphos	300 kg
	Fertico	600 kg
	B&B	300 kg

ANNEX 7

Ready Reckoner of Certified Organic Farmers in Australia in 1997.

NASAA 340
BFA Approximately 350
BDRI An estimated 80
OHGA. Estimated 250
OVA Estimated 20

Total 1000.

This figure is a rapidly changing one with on-going departure and admission of new operators. The OHGA has probably displayed the most significant growth in the last 12 months with a very low cost service being offered. BDRI is probably the most stable in numbers with a deliberate operational policy to only instigate certification amongst the much larger number of practitioners when market opportunity arises.

BFA numbers have reportedly dropped overall with more stringent follow-up procedures instigated in the 1996/7 period, although current levels may have plateaued for now. NASAA figures remain largely unchanged for the past two years.

Of more significance than numbers themselves, is the composition of the numbers. NASAA certified growers have a minimum levy payable before 1% of sales is payable. This figure is $20,000. Currently, approximately 2/3 of all growers are on the minimum levy.

The same could probably be said for the BFA except that historically, few records of production figures have been kept by this group and fewer levy collection events which have made the process of determining production and input use even more difficult to estimate. Unlike NASAA, the BFA has only recently instigated an annual return with the details of production and input usage. It has been indicated from the BFA that there are similar large numbers of small growers and the 20% figure which represents medium sized growers with likely fertiliser usage is probably still pertinent.

In the OHGA, grower size is reportedly much smaller with the vast majority of operators falling into the low input category and as the production is chiefly of herbs, the intensive small scale nature of those operations is likely to be largely unchanged for the near future.

The BDRI, utilise biodynamic techniques and are in principle non users of fertilisers, but in practice the modest numbers of certified growers are users of a range of fertilisers for maintenance and fertility improvement. The nature and extent of production is largely unknown as certification and marketing are not conducted in the mainstream, but there is evidence that some significant producers make up portion of the BDRI licensees with a perhaps similar number of significant commercial producers who would use fertiliser as the BFA and NASAA, although, by definition, fertiliser usage would be diminished in comparison.

The OVA comprises only a very small number of operators, a few of whom may be significant fertiliser users.

READY RECKONER SUMMARY

If one takes the current situation and examines those operators in category 2, then there are less than 200 operators who would have any significant current demand for fertiliser.

Of these 200, approximately 30% may be involved in manufacturing their own fertiliser in the form of compost from a variety of sources with minimum usage of any commercially prepared product.

Bone/Meat Ash Fraction and its potential role as a fertiliser in the organic industry

Meat Research Corporation Contract

ANNEX 6 SURVEY QUESTIONNAIRE AND RESPONSES

Region of Location	Crops	Growing Area	Fertilisers Type Used	Quantity of Fertilisers Used
Sunraysia	Citrus and mixed fruit	5-100 ha	Rockdale Compost Blood and Bone	> 10 tonne <5 tonne
Central Victoria	Cattle, oilseed and carrots	5-100 ha	Fertico Green'n Grow Lime	<5 tonne >10 tonne
Adelaide Hills	Apples	5-100 ha	Blood Meal	<5 tonne
South East South Australia	Cereals, oilseeds and livestock	100-1000 ha	Guano RPR	<5 tonne <5 tonne
Margaret River Western Australia	Vines	0-5 ha	Blood and Bone Fish Emulsion Compost	<5 tonne <5 tonne <5 tonne
Northern NSW	Avocados	0-5 ha	Dynamic Lifter	<5 tonne
Tamar River Tasmania	Salad Vegetables	0-5 ha	Organotech Fish Compost	<5 tonne <5 tonne
West Gippsland Victoria	Cattle and apples	5-100 ha	Nil	
Central Victoria	Carrots and potatoes	5-100 ha	Terra Firma	5-10 tonne
Balranald NSW	Wheat and oilseeds	1000 ha+	Nil	
Central Victoria	Herbs	0-5 ha	Compost	<5 tonne
Central NSW	Cereals and sheep	100-1000 ha	Neutrog Dynamic Lifter	<5 tonne <5 tonne
Central NSW	Wheat and oats	100-1000 ha	Nil	
North Central NSW	Wheat	1000+ ha	Nil	
Central Gippsland Victoria	Potatoes	0-5 ha	Dynamic Lifter	<5 tonne
South Western Victoria	Mixed Vegetables	5-100 ha	Terra Firma RPR Lime	5-10 tonne 5-10 tonne >10 tonne
Sunraysia	Citrus and vines	5-100 ha	Jomoco (Green'n Grow) Grape Mart	5-10 tonne 5-10 tonne
Northern NSW	Mixed Vegetables	0-5 ha	Compost	<5 tonne
Central Queensland	Cattle	1000+ ha	Nil	
Emerald Queensland	Cereal, oilseeds and sorghum	100-1000 ha	Nil	
Central Victoria	Potatoes and sheep	5-100 ha	Terra Firma	>10 tonne
Central Victoria	Potatoes and Vegetables	5-100 ha	VicMill and Fertico RPR Lime	5-10 tonne 5-10 tonne >10 tonne
Central NSW	Wheat, oats and sheep	100-1000 ha	Nuetrog Rockdale Compost	<5 tonne >10 tonne
Central NSW	Cereals and sheep	100-1000 ha	Guano	5-10 tonne
South Gippsland	Milk	5-100 ha	Basalt Dust Dolomite	>10 tonne >10 tonne
Northern Victoria	Cereal, oilseed and sheep	5-100 ha	RPR	<5 tonne
Western NSW	Oilseed and cereal	1000+ ha	Nil	
MIA NSW	Rice	100-1000 ha	RPR	5-10 tonne

Contractor
Rod May
Captains Creek Farm
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BLAMPIED
Victoria

MICROBIOLOGICAL CONTENT AND SIGNIFICANCE.

The microbiological components of the meat/bone fraction are described by D Roberts and are at levels of fairly low significance. Other chemistry is the complex breakdown components of living organisms more or less denatured by the processing treatments.