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ORGANIC AND ORGANO-MINERAL FERTILISERS IN EUROPE PAST, PRESENT AND FUTURE[1]

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SUMMARY

Organic fertilizers and even organo-minerals are enjoying in Europe a status confining confidentially with nuclear production in marketing and specialized use. Subject for the moment only to individual national regulations, without any European harmonization and practically no competition, their particular status helps them to weather the yo-yo times experienced by other fertilizers. Changes are however in the offing since the European Commission has been working on new harmonization directives and there is a serious push towards "recycling", irrespective of the source of the nutrient. Manure, municipal sludges and other sources of nutrients are vying for a better place in the sun while limits have been set for nitrogen spreading and pressures are building up for limiting the amount of "undesirable" elements. An overview of the whole field will be given including European Commission's work in the regulatory field with the SLIM II exercise for fertilizers and European standardization contribution. An attempt will be made to gaze into the crystal ball of the future.

RESUME

Les engrais organiques et même organo-minéraux ont un statut limité confidentiellement à une production, commercialisation et emplois spéciaux atomisés. Pour le moment soumis à des réglementations nationales individuelles sans aucune harmonisation européenne, ni pratiquement de concurrence, leur statut particulier les aide à survivre aux cycles de yo-yo connus avec les autres engrais. Des changements sont pourtant en vue car la Commission Européenne oeuvre sur de nouvelles directives d'harmonisation et il y a une tendance sérieuse vers un "recyclage" indépendamment de l'origine des nutriments. Le fumier, les gadoues municipales et d'autres sources de nutriments cherchent à avoir une meilleure place au soleil pendant que des limites étaient fixées pour l'épandage de l'azote et des pressions se manifestent en vue de limiter les quantités d'éléments indésirables. Une vue d'ensemble de ce domaine sera présentée y compris le travail de la Commission Européenne dans le domaine réglementaire y compris l'exercice SLIM II pour les engrais, la contribution à la normalisation européenne et un essai sera fait pour deviner l'avenir dans la boule de cristal.

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I. INTRODUCTION

Although there are various studies as to where and when intentional cultivation began, no one seems to have been interested at the origin of fertilisation. Nevertheless it can be reasonably assumed that the very early farmers, if they practised some sort of animal husbandry, must have noticed the effects of manure. Other organic "residues" would have followed suit, eventually much later on. Products we know now however, are of relatively recent innovation, mainly due to agro-industrial development. The point is, what is an organic fertiliser and what is not? The debate is endless since definitions vary from place to place, and in time. It is to be expected that it will not stop even if European regulatory bodies step in to harmonise because they will have to overcome usage forged by centuries and some deep-rooted convictions which are tantamount equivalent to a religious belief. So, all that follows is simply an attempt to shed some light into a confusing set of "data" and clear some of the smoke of the battlefield. It can also be said that whatever the fertiliser, the starting material is in fact a waste, and in order to become a saleable product, it has been subjected to some sort of transformation.

[1] *Engrais organiques et organo-minéraux en Europe - Passé, présent et futur*

II. DEFINITIONS

For the moment there is no clear set of definitions regarding organic and organo-mineral fertilisers in Europe. Most of the existing definitions can be traced back to different bodies of interested parties, most of which do not appear eager to come to a common denomination, much less to a common specification for any given "product".

We can find the past "classical" definition of organic as anything being "of natural origin". This shortcut definition has led to the establishment of positions which now are hard to avoid and lead to some confusing results. The same can be said of the philosophy underlying the bio-agricultural area where choice of products and their definitions seem dictated by beliefs rather than by cartesian reasoning.

The European standardisation body, CEN, is making an attempt through the vocabulary standard which is now in the stage of enquiry. The definitions are as follows:

- Organic fertiliser: Carbonaceous materials of vegetable and/or animal origin added to the soil specifically for the nutrition of plants.
- Organic nitrogenous fertiliser: Organic fertiliser in which the nitrogen is bonded directly to carbon and which may contain other elements but which do not have declarable phosphorus or potassium contents.
- Organo-mineral fertiliser: Fertiliser in which declared nutrients are of both organic and inorganic origin obtained by mixing and/or chemical combination of organic and inorganic fertilisers or products.

Such definitions, which refer to declared or declarable plant nutrient contents, shift the responsibility of defining an organic fertiliser to the regulatory bodies. No general rules appear to govern the admission of fertiliser into the technical annexes of the existing EC fertiliser directive nor the one related to biological agriculture. When one looks on how the matter has been handled in the existing national regulations, one can see that there is some common background but no consensus when it comes to details; to the point where a German fertiliser is an organic soil improver (conditioner) in France and so on.
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Nevertheless, CEN, after having studied the whole area and having written a technical report on organic fertilisers which was given to the European Commission, i.e. the DGIII Working Group "Fertilisers", was awarded a mandate by the Commission to make a proposal for the definition, designation and specifications of organo-mineral fertilisers. The aim of the whole exercise, being a European regulation, is to expand the existing 76/116/EC directive for mineral fertilisers.

In a number of countries, the regulatory definition of an organic or organo-mineral fertiliser is based on the presence of a certain amount of nitrogen linked to carbon; the so-called organic nitrogen. The minimum level of organic nitrogen for straight organics varies from 1 to 3% and for organo-minerals it is not less than 1%. Products which do not have these amounts are still used in agriculture but with a different aim which is to provide organic material to the soil to alter its physical properties. The denomination then is organic soil improver. Such definition still does not solve the problem since, in the case of manure for instance, even after treatment, the final product may be either sold as fertiliser or a soil improver, depending on the relevant national regulation. The same holds for sewage sludge.

In line with what was proposed by CEN and for the sake of simplicity, an organic product would be a transformed waste material of animal or vegetable origin having a minimum of organic nitrogen and products originating from animal excreta would be accepted as fertilisers but be given a differentiated status.

The proposed "classification" for nitrogen bearing products is therefore the following:

- organic fertilisers of animal origin,
- organic fertilisers of vegetable origin,
- organic fertilisers based on animal excreta,

all having a minimum amount of organic nitrogen not less than 3%. All other products would be classified as organic soil improvers or simply excluded.

As for organo-mineral fertilisers, any of the above organics can be mixed with any of the accepted mineral fertilisers provided the organic nitrogen content is not below 1% and that the resulting product is safe. To note however that there are products based on lignite or peat, legally sold on a national market, which are still called today "organo-mineral" despite the absence of any organic nitrogen. To solve this riddle a proposal was made by CEN to call these products "organic based fertilisers".

Once a definition of organic nitrogen is decided on by the regulatory bodies, the remaining difficulty lies with the analytical methods. As of today, no direct method for analysis has been proposed and, in the meanwhile, the only way that has been accepted is through the determination of total nitrogen from which all the other, directly analysable nitrogen species, are subtracted. This is not a good solution since analytical errors may add up to more than 1%, in which case a fertiliser not having any organic nitrogen may still become an organo-mineral.

III. PRODUCTS

A. Organic fertilisers

From the agronomic point of view, the purported advantage of organic fertilisers is the use of readily available material having some "slow release" properties since organic nitrogen has to undergo several transformations - mineralisation - before becoming available to the plant which usually can only consume nitrogen in the nitric form. Organics also have a connotation of being "natural" rather than "synthetic" or "chemical" which point is deemed to be important in the area of biological or sustainable agriculture, whatever may lie behind such beliefs.

Product characteristics have been refined by past use or availability and today are determined by national regulations as far as their analytical content is concerned. Sometimes there is also a requirement regarding particle size but the latter is rather an exception. No other requirements have been made regarding physical properties. Note that there is a market trend to switch from powders to "granular" products.

At the moment there have been no direct written general requirements regarding efficacy or inocuity of products since this did not seem to be a major concern in the past. However, the growing awareness of consumers and the advent of BSE (the "mad cow disease") has prompted measures which tend to eliminate from the market products which are deemed to carry a risk and admit only selected products which have been previously subjected to specific treatments designed to eliminate the risk. Other proposals relate inocuity from the general point of view and address bacteria which tend to proliferate under humid conditions when sufficient nutrients are available. Such a proliferation may have a detrimental effect on the inocuity of the product during handling on the one hand and, on the other, may generate methane and methane-air mixtures which tend to ignite or even explode. The proposal is to limit the water content of the fertiliser below 14-15% so that bacterial proliferation is kept to reasonably low levels.

The odour problem as not been addressed at all but it is clear that market will not accept a bad smelling product, whatever its other qualities may be. This is a subjective matter and will have to be faced by producers. A slight odour may be acceptable to a farmer who handles "smelly" materials every day, but will hardly be accepted by the individual hobby gardener. It is also difficult to imagine that workers involved in the manufacture of such fertilisers would accept permanently to work in such conditions, not to speak of the neighbourhood of any production facility. In fact, this problem is not so acute with current straight organics, it appears practically only with fertilisers originating in animal dejections. Animal excreta not only undergo drying but, usually, some other form of chemical processing which includes oxidation or addition of mineral products. They cannot therefore be classified as organics but usually end up as a part of the organo-mineral class.

B. Organo-mineral fertilisers

All the characteristics of products mentioned in the case of organic fertilisers are valid for organo-mineral products. The addition of the mineral part is designed to compensate for the lack of certain agronomic features of simple organic products. The introduction of a mineral component may, however, bring some undesirable properties and products will have to be monitored carefully before being put on the market. The one particular case is the presence of the nitrate form of nitrogen in a product. Nitrates being known

oxidisers, their presence in the mass of a reducing material is not desirable; it leads to unstable compositions

which have a tendency to burn easily. Therefore a limitation of the amount of nitrate nitrogen present in organo-mineral fertilisers has been proposed for obvious safety reasons.

The above mentioned item concerning odour must also be dealt with.

Examples of individual organic products proposed for the future addition to the EC fertiliser directive are given in Table 1 in annex. These are only examples, it is not the entire proposal since this is still a "Working Paper".

C. Particular sources

Important items are missing from this product chapter. One concerns products derived from urban waste water sludge or the sludges themselves. Sludge has a particular status in Europe since both urban and industrial sludges are covered by the directive 86/278/EC. This regulation addresses, through its technical annexes, the requirements imposed on sludges in view of their spreading on land or, in other words, their suitability for agricultural purposes. Therefore, in order to avoid confusion and even though such waste carries plant nutrients, these "products" have not been included in the future additions to the fertiliser directive nor have they been included in the CEN proposals despite intensive lobbying. At this stage, the existing "sludge" directive, despite written intentions, has only dealt with urban sludges and not those originating in the industrial sector since the latter are too diverse to be dealt with under one single set of rules. Every industrial sector would necessitate at least its own specific rules, if not each product. Furthermore, the whole matter is now being reconsidered, and the urban waterworks sludge part revised with the aim of imposing tougher rules than before. Nevertheless, this type of waste must be mentioned since plant nutrient content and total amounts are far from negligible for the whole of Europe. Amounts are on the increase since mandatory waste water cleanup will approximately double the amounts generated within the next ten years.

Another item which has only been partly dealt with is animal manure. This is not a commonly accepted organic fertiliser on the market. It has however gained a certain status in some countries, mainly the poultry manure, and as of late, thanks to the Dutch attempts to get rid of their livestock manure through transformation into organo-mineral NPK fertilisers. For the latter, three production units at least have been built and product is being shipped to whatever customer would accept it. It is not an economic success for the moment but it can be reckoned that with heavy taxes imposed on manure coming from intensive husbandry and mandatory spreading constraints, the picture will change in due course.

IV. MARKETS

A search for data on markets of organic or organo-mineral products of the past has not been a success, as if these markets did not interest anybody, historians included. However, ads in newspapers and in "specialised" press can be retrieved dating back to pre- World War I which indicate that although some products like the Peruvian guano enjoyed widespread acceptance, others were distributed on a more restricted scale, only to local markets.

One may think that today we are much better off with producers' organisations and national and international bodies dealing with market statistics. Somehow however, the fertilisers we are dealing with have managed to slip through the fishing net. Just to name a few, Germany has no official statistics, neither seem to be there any statistics for Belgium and Holland or the UK. France has production figures only since the past six years for organo-minerals but nothing yet for organics. Italy is apparently better off than France.

Since Europe has been in construction for the last forty years, there is a strong temptation to turn to European bodies, ie. the Eurostat. Alas, customs positions, that is the numbers and definitions under which international trade is reported under the Eurostat system, do not differentiate clearly between organics and organo-minerals, and much less between different items. Six customs positions deal with our products at different levels of incorporation with a distinction between the type of packaging. If one gives it a more careful look, two main remarks can be made:

- both positions 3101 and 3105 with their respective subpositions are "polluted" by the inclusion of mineral compound fertilisers.
- A look on the numbers representing the tonnage of exports/imports shows wide discrepancies depending on the country which makes the declaration. For instance, for position 3101, Belgium declares that Holland has imported in 1996 362 046 tonnes of product from Belgium while Holland declares that Belgium has exported to Holland 292 214 tonnes for the same period! No comment.

All that can be drawn from the Eurostat figures is an approximate amount of trade between countries and an attempt to correlate those figures with whatever production data is available. Nevertheless it is all guesswork, educated or not. To put it in a nutshell, approximately 900 000 tonnes of products have been "exported" by EU Members to other EU members in 1996 when customs position 3101 is considered. This is a 50% increase from 1992. Discrepancies with import data show that the 50% may be an overestimate. The trend for increase is nevertheless evident. There are strong exchanges between Belgium and Holland and to a lesser extent with France and Germany. This points to products coming from intensive livestock or poultry breeding but may include sludges from Germany.

For production data, should one stick to the more formal definition of organics rather than to the wide Eurostat compendium, estimates become much modest even if they include dried poultry excrements. (see Table 1 in annex). Hide and leather products are mainly made and used in Italy, Spain and the south of France after comminution and/or hydrolysis. Direct use is limited, products are mainly incorporated into organo-mineral compound fertilisers. Slaughterhouse waste like dried blood, meat meal, bone meal and so on, are loosing importance due to the "mad cow" disease and ensuing regulatory measures. Poultry manure gives rise to extensive production by drying and granulation. Processes tend to be rather elaborate in Italy, simpler in Holland. Quite an amount of straight nitrogen or compound products will go to hobby gardening as in Germany, UK or France.

For organo-minerals, as previously stated, some statistics exist, but the rest is guesswork so the data given also in Table 1 in annex should be viewed with extreme caution. More so since definition varies from country to country as is the case of lignite and peat being accepted as organic products in organo-mineral fertilisers in the UK or peat being accepted in Italy.

Markets taken up by the two base materials i.e. manure and urban waste water sludges briefly mentioned in the section above should be considered on their own since these products and their possible derivatives do not fit into the "classical" definition of organic or organo-mineral fertilisers. It is the sheer amount of nutrient elements which are used directly or indirectly which matters and an attempt to size the amounts is given in table below.

	Quantity K tonnes DM*/y	**Nutrient content estimates K tonnes / y**		
Material		**Nitrogen**	**P_2O_5**	**K_2O**
Manure		7071	3347	7229
Sewage Sludge	11 500	546	552	48

* DM: Dry Matter

The quantity of nitrogen from manure must be considered as unavailable to plants due to the fact that a major part is composed of urea which gives rise to losses both before and after spreading of the product. The quantity of sewage sludge is open to discussion since different sources indicate quite different numbers. The figure given above should be considered as the high side for 1998.

It should also be noted that such products have in fact no price but a cost, since they originate from, or are just, waste which has to be disposed of one way or another. Furthermore, the disposal of sewage sludges into landfills with urban waste will not be allowed anymore, the same as disposal at sea. The only remaining possibilities will be specialised landfills, incineration or spreading to agricultural land under specific conditions. It is clear that all such disposal processes are costly, the costliest being incineration (somewhere around 150 euros/t) and the cheapest being land spreading.

So, the question is, what are the future orientations going to be? If anything can be taken from past trends of

the production / consumption patterns, one can safely assume that past trends are going to hold on for some time for existing products in the organo-mineral sector which appears immune from the vagaries that have hit in the past the manufacturers of mineral fertilisers for instance. That is, not taking into account any problems like the "mad cow" disease which have hit the organics part quite heavily. I do not believe that the expansion in the traditional existing products will take on an exponential increase unless some big players decide to enter the market.

This caveat is true for the two items just mentioned before regarding products derived from manure and sewage sludges. The present "players" in the field do not have the financial clout to build the necessary transformation units nor do they appear to have the inclination to handle such "lowly" waste, it is clearly not their present philosophy; their philosophy and preference go to using "noble" products such as leather or hide or hydrolysed meat or feathers all of which tend to obtain higher prices in the market. On the other hand there are already big players in the field of sludge spreading. This concerns industrial sludges like those coming from the sugar industry where available amounts of waste are in the same order of magnitude (8 800 000 t/y) as sewage sludge much more localised and therefore handled practically directly by the producer. So the writing is on the wall, provided incentives are brought to bear. This has already happened in Holland where pig and cattle manure units have been built and operated by concerns other than the existing organo-mineral producers. If the output is not a success, this has to do with economics as well as with final product acceptance. Environmental pressure and use of "economic tools", a euro-euphemism for taxes, may totally change the picture of today.

In this crystal gazing exercise, I have not forgotten one important element, ie. product regulations. It has been stated that the Commission intends to harmonise legislation in organics and organo-minerals across Europe. The work has already started but has suffered some setbacks for the moment. From now on, all will depend on priorities of the Commission and possible insider pressures. The Commission has to deal with at least three things in the fertiliser area:

- The harmonisation of existing EU legislation on fertilisers by pulling all existing directives into only one and producing harmonised technical annexes. This is the SLIM II exercise which has been endorsed by the Council and the work will have to proceed at reasonable pace. Given the past experience regarding the "codification" exercise, at least two to three years will be needed to thrash out a consensus on the directive itself which, being a Council directive, will have to go through the gruelling parliamentary hearings and so on. There are bound to be delays.

- Decide which precautionary measures should be taken in relation to the inocuity of the future organic and organo-mineral fertilisers. The problem has been settled only recently in France but the relevant legislation may take time to be published.

- Finally there are the data gathering exercises for the risk assessment of cadmium in fertilisers and subsequent discussions on the eventual risk management. Cadmium having been an unresolved issue for the past 15 years, there is no reason to believe that everything will go smoothly at top speed.

It is therefore a safe bet that nothing will come out by the turn of the millennium and fair bet would be for around 2005. It also a good bet that manure will be admitted while sewage sludge will not. Even though the change will not come immediately, if the potential rewards seem promising, new players might be tempted to enter the game in which case there would be a fundamental change in the market and a challenge for established producers and markets.

Last but not least, remains the price question which has not been dealt with. Some indications stemming from personal communications show that organo-mineral fertilisers cost the farmer anything between zero and 20 to 30% more than usual mineral fertilisers on per tonne basis, this may amount to a unit nutrient cost increase of about 40 to 60%. This is what one can call a perfect niche market where a specialised product brings an interesting price.

A look on Eurostat figures shows that there is at least one to thirty differences between products sold from different countries. It is clear that countries declaring exports of products in the range of 25-50 euros / t do not sell the same product as those declaring to sell from 160 up to 1000 euros / t! No one will accept such price differentials for the same thing. It simply shows that products traded in the northern triangle (France-Belgium, Holland, Northern Germany) mostly trade in transformed manures whereas trade from Italy, Portugal, Spain and United Kingdom is in special or very special products justifying their high prices. Once again a perfect niche market developed by the southerners while the northern part of Europe is struggling to get rid of its waste.

V. PRODUCERS

From what we have seen about the prices and what can be gleaned from the Eurostat, how ever imperfect, and what is just plain producers' information, it all shows that there are at least three categories of producers:

- Those that work mostly with manures, sludges and like products, necessitating heavy equipment and financial support. Their units are in and above the 100 000 t/y capacity range at least and their production does not exceed a price tag of more than 60 euros /t. This type of unit has developed in Holland but still has to earn its keep.

- At a somewhat lower level, in the 100 000 t/y capacity range and below, producers manage to provide local markets not exceeding a shipping radius of 150 km where they maintain a fair lead in products of the organo-mineral type and a price tag of anything between 150–250 euros/t. These outfits are quite profitable, usually family- or small coop- owned. One exception may be Italy which has developed profitable units in organo-minerals of much bigger size, servicing more than local markets since they export a part of their production.

- Finally there are the outfits which produce at price levels above 300 euros, up to 1000. These units are small, 1000 to 10 000 t/y range and produce very special products accepted by the regulations in their country like the case of humic acids in Spain. Such products can only be sold elsewhere in Europe if the other Member states accept them on individual basis. In this case the products are usually organics, most of which may not find their way into the future European regulation. It is perhaps just as well for these special producers because they are holding a very specific niche, and are even protected from encroachment by regulations and sometimes patents; no one could dream better life.

All the foregoing should not however lead to the misconception that organic and organo-mineral producers are people dedicated to those products only. In fact there are numerous cases, mostly in the organo-mineral area, where producers are able to provide the market both with mineral and organo-mineral products. It depends on the type of granulation process and capacity they have. There is no clear cut definition and production depends on the market mix such producers may serve. On the other hand, dedicated producers do exist; for instance when their process is geared to produce pellets by extrusion in simple production lines. Such a process can hardly produce granules of the common mineral type fertiliser and those extrusion units may or may not be used all the year round. Some of them are small and known to be operating only a part of the year, just to consume a residue available immediately after harvest. The fertiliser is stored and unit remains idle. A typical case would be the production of a compound like 3.6.9 based on winery residues.

VI. CONCLUSIONS

To sum up a rather complex matter, I would say that:

- Organics and organo-mineral fertilisers will continue their present development failing accidents like the "mad cow" problem.

- Development will not be harmonious in all sectors of this industry since medium scale producers will have to follow the trend of rationalisation to survive and pursue their existing goals of excellence to be able to maintain their margins. It may help to be able to produce a mix of mineral and organo-mineral products.

- It is highly probable that under the pressure of taxation, environmental awareness/regulations and so on, new players will enter the field of organo-minerals just for the sake of recycling unwanted residues or even residues for which past disposal techniques will be hindered by regulations or disappear altogether.

- There will be a tendency for prices to erode under the pressure of these big outfits coming in.

- During the past years a resistance to waste recycling has developed among farmers and it will be hard to overcome. Insurance and "disaster" funds have developed to this end and the trend will continue since the farmer cannot afford to jeopardise his farm or his produce.

- New fertiliser regulations will come, but slowly. They will more or less affect the existing patterns depending on the type of product they address and requirements set out. The general idea however is to open up the European market to more internal trade.

Table 1

Production / Consumption of organic and organo-mineral fertilisers
For selected countries in Europe
1996/1997

Country	Organic fertilisers Tonnes / Year	Organo-mineral fertilisers (OMF) Tonnes / Year	Remarks Exports OMF kt/y
Belgium		?	> 300
France	20 – 30 000	190 000	
Germany	<10 000	?	> 30
Holland	100 000	?	> 330
Italy	200 000	375 000	
Spain	< 50 000	?	> 11
United Kingdom	< 20 000 (100 000?)	80 000	
Others	20 000	150 – 200 000	
Total	400 – 500 000	700 000	

Table 2
Denominations / Specifications of organic and organo-mineral fertilisers
Selected Items

Denomination	Minimum requirements	Other requirements	Declaration
Straight organic fertilisers: nitrogenous, A) of Animal Origin			
Dried blood	Total nitrogen >12% C/N ratio < 6		Total Nitrogen (Nt) Organic Nitrogen (No) Organic Carbon (Co)
Hide	Total nitrogen >10% C/N ratio < 6		Total Nitrogen Organic Nitrogen Organic Carbon
Hoof & Horn (Meal)	Total nitrogen >12% C/N ratio < 6	90% passing through 2mm sieve for meal	Total Nitrogen Organic Nitrogen Organic Carbon
Hydrolysed Feathers	Total nitrogen >12% C/N ratio < 6		Total Nitrogen Organic Nitrogen Organic Carbon
Of mixed animal origin	Total nitrogen >10% C/N ratio < 6	Origin to be declared when content above 20%	Total Nitrogen Organic Nitrogen Organic Carbon
B) of Vegetable Origin			
Oil Seeds	Total nitrogen > 4.7% C/N ratio < 15	The original name of the seed shall be declared. Castor oil seed excluded	Total Nitrogen Organic Nitrogen Organic Carbon
Grapes Residues	Total nitrogen >2.3% C/N ratio < 15		Total Nitrogen Organic Nitrogen Organic Carbon
C) of Mixed Origin			
Of mixed animal and vegetable origin	Total nitrogen >5.9% C/N ratio < 12	The origins of the materials will be stated when > 20% . Individual criteria for components must be met	Total Nitrogen Organic Nitrogen Organic Carbon

Table 2
suite

Denomination	Minimum requirements	Other requirements	Declaration
Compound Fertilisers NP **A) of Animal Origin**			
Bone (Meal)	N+P_2O_5 > 20% Nt>4.7% P_2O_5>16% C/N ratio <6	90% passing through 10mm sieve for bone 2mm sieve for meal	Nt, No, Co, Total P_2O_5
Degelatinised Bone (Meal)	N+P_2O_5 > 20% Nt>3.5% P_2O_5>15% C/N ratio <6	90% passing through 2mm sieve for meal	Nt, No, Co, Total P_2O_5
Fish (Meal)	N+P_2O_5 > 10% Nt>4.7% P_2O_5>4% C/N ratio <6	90% passing through 2mm sieve for meal	Nt, No, Co, Total P_2O_5
Guano	N+P_2O_5 > 20% Nt>11.8% P_2O_5>8% C/N ratio <6		Nt, No, Co, Total P_2O_5
Meat (Meal)	N+P_2O_5 > 13% Nt>7% P_2O_5>5% C/N ratio <6	90% passing through 2mm sieve for meal	Nt, No, Co, Total P_2O_5
B) Of vegetable origin			
Sugar beet vinasse	N+K_2O > 7% Nt> 2% K_2O >5% C/N ratio <7.5		Nt, No, Co, Total K_2O
Compound fertilisers NPK **A) of Animal Origin**			
Processed animal excrements	N+P_2O_5 +K_2O > 8% Nt>2% P_2O_5>2% K_2O > 8% No > 50% Nt No>1.7% C/N ratio <15	Nitric N < 1.5% Cu and Zn to be declared when>0.01%	Nt, No, Co, Total P_2O_5 Total K_2O
Fish Compost	N+P_2O_5 +K_2O > 8% Nt>2% No>1.8% P_2O_5>2% K_2O > 2% C/N ratio <10		Nt, No, Co, Total P_2O_5 Total K_2O