FERTILIZER LABELLING AND STANDARDS CODE FOR INDUSTRY

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Abstract

In Australia, many fertilizer companies operate manufacturing, import and distribution facilities in several States, and market across State borders.

Fertilizer regulations are set by the States, and while the intent is similar, there are significant variations in the legislation. This lack of harmonization adds to compliance costs and impedes the development of a competitive fertilizer industry. It also leaves the potential for fertilizer suppliers to exploit differences in the legislation, to the detriment of Australian agriculture in meeting food safety, environmental management and international trade expectations.

FIFA is seeking the establishment of soundly based and consistent minimum standards for fertilizers and the national application of such standards across all States and Territories, and the application of these standards to all participants in the industry.

FIFA has developed a proposed Industry "Code of Practice for Fertilizer Standards and for the Labelling of Fertilizers" (excluding soil amendments).

FIFA is now seeking to discuss the Code with State Regulatory Authorities and Farmer Organizations in an effort to gain their support and recognition for the Code.

Current Regulations

In Australia, fertilizer legislation is set by the States. There is no federal body, such as the National Registration Authority for agricultural and veterinary chemicals, overseeing fertilizer regulations.

FIFA has reviewed the State Fertilizer Regulations and found a number of variances. Those of greatest concern to FIFA are:

Scope of regulation - In broad terms the regulations cover:

- mineral fertilizers which contain the major plant nutrients, nitrogen phosphorus, potassium, sulfur, calcium and magnesium
- micronutrients (trace elements)
- soil ameliorants and conditioners such as lime and gypsum
- organic materials of animal and plant origin

There are however inconsistencies in the definition of what constitutes a fertilizer. One State specifically excludes sewage sludge from the scope of its regulations while others include it.

Definitions - The various Acts and Regulations contain definitions of various terms and there are numerous inconsistencies in these.

Labelling requirements - FIFA has identified over thirty different general requirements for what is to appear on the label and how bulk deliveries are to be labelled. One State only requires two of thirty requirements while others specify up to seventeen. Some States exclude certain pack sizes from labelling requirements.

Forms of nutrient and other characteristics - Most States require a label statement of the major nutrient content and the form in which it occurs. However, there are a number of variations in the requirement for the form to be stated. The States differ in their requirement for a label statement on the particle size of certain products and the content of a range of impurities.

Warning statements - The requirement for warning statements vary significantly between States both in respect to health warnings and warnings about the content of certain impurities.

Standards for maximum permissible levels of impurities - Although standards for heavy metal impurities were agreed by ARMCANZ several years ago, some States have not fully adopted these.

Standards for maximum permissible levels of microbial contaminants - At present there are no standards covering acceptable levels of microbial contaminants in organic fertilizers. One State has implemented Environmental Guidelines for sewage sludge (excluded from fertilizer regulation) which include microbial standards, based on USA sewage sludge standards.

Standards for methods of manufacture and nutrient content of certain fertilizers -

A number of States prescribe minimum nutrient or plant and animal contents for certain descriptions of fertilizers (inorganic and organic) and in some cases prescribe their method of manufacture.

Standards and grades for gypsum and liming materials - Most States specify the minimum physical and chemical characteristics of grades of lime and gypsum, however there are a number of significant discrepancies.

Sampling methodology - Some States do not specify the method for taking samples for the purpose of compliance testing. Several States call up methods published by the Association of Official Analytical Chemists and some detail the method to be used in their regulations.

Methods of Analysis - Some States do not specify the analytical methods to be used for the purpose of compliance testing. Several States call up methods published by the Association of Official Analytical Chemists and one specifies methods recommended by the National Association of Testing Authorities in Australia.

Tolerances for variation to minimum nutrient content stated on label - All States provide for some tolerance of variations to the nutrient content stated on the label (to account for sampling and analytical error). However, there are significant differences between the various States.

In Australia, most fertilizer companies sell across State borders. Some companies make an effort to comply with the most stringent State legislation, others with the legislation of the State in which their head office is located or the product is manufactured or imported. Few, if any, label fertilizers differently to market into different States.

In general, the States exercise a degree of flexibility in the interpretation of their Acts. They expect products to comply with the intent of their legislation, rather than to be in strict accordance with the Acts. Compliance with another State's legislation is generally regarded as acceptable. However, there are aspects of the legislation where the States expect full compliance, such as the statutory limits for heavy metals impurities.

There is, however, potential for suppliers to exploit differences in the State Acts. Given the provisions for free trade between the States under the Mutual Recognition Act 1992, it is possible that products that do not comply with some State Acts may be marketed across State borders, provided the products comply with the legislation in the State of Origin.

This not only puts other suppliers at a competitive disadvantage, but may potentially allow products to be used which in the long term may be detrimental to Australian agriculture. The sustainability of land resources may be affected, and the ability to produce food within food safety standards compromised.

As an example, in the early 1990s when few States set maximum limits for heavy metals, some micronutrient (trace element) fertilizers containing in excess of 20 000 mg/kg (2 %) lead (Pb) were marketed in some Australian States, while other States set a maximum limit as low as 500 mg/kg Pb. Since that time, all States have tightened their legislation. However, anomalies still exist, and as a consequence, not all fertilizer suppliers are competing on a level playing field.

The FIFA Code

FIFA members, who together sell in excess of 95 % of the inorganic nitrogen (N), phosphorus (P) and potassium (K) fertilizers sold in Australia would prefer to have the States adopt uniform regulations.

Consultation between the individual States and FIFA on each occasion a State Act has been revised has been excellent. However, the time frame over which this is done, changes in knowledge and varying responses to specific issues results in some anomalies between the State Acts.

In recent years, Governments have shown a willingness to accept self-regulation by various industries, in lieu of legislation.

With this in mind, FIFA is working on a "Code of Practice for Fertilizer Standards and for the Labelling of Fertilizers". Recently FIFA discussed its proposed Code with the National Cadmium Management Committee (NCMC) which was established by the Standing Committee of Agriculture and Resource Management (SCARM). All members of the NCMC endorsed the principle of codes of practice for regulation of fertilizer standards and labelling.

FIFA has approached the State Regulatory Authorities for their comments and thoughts on the workability of the proposal. The views of rural producers will be sought through the National Farmers Federation.

If the proposed Code is acceptable to all States it should enable it to be called up by the relevant Fertilizer Act or Regulation and thus provide a means of achieving uniform requirements.

The FIFA Code does not deal with soil amendments such as lime, dolomite or naturally occurring gypsum because there are other industry associations representing the suppliers of these products.

FIFA's expertise is largely confined to N, P, K, sulfur (S) and micronutrient fertilizers, and those calcium (Ca) and magnesium (Mg) compounds which are used for their nutritive value rather than as soil amendments to correct soil acidity or improve soil structure. Phosphogypsum is included in the Code as FIFA members are the key suppliers of this product in Australia.

At this stage the proposed FIFA Code does not cover unprocessed organic wastes and farmyard manures, sewage sludge or biosolids. However, several FIFA Members either process organic wastes to produce fertilizer or utilize organic products in some of their blends.

Microbial contaminants in organic fertilizers may pose a serious food safety risk with some products and crops. FIFA is proposing the establishment of a Working Party that would include non-FIFA manufacturers of organic products to investigate and recommend appropriate standards for organic products.

If the FIFA Code is accepted by the State Regulatory Bodies, all FIFA members will be required to comply with the Code. A time period of 30 months (2.5 years) will be allowed for FIFA members to make the necessary label changes, so that stocks of old product and pre-printed packs can be cleared. This itself is a costly process, and is best done at a time that other label changes are to be made.

Key Provisions of the FIFA Code

There is considerable agreement between the State Acts, and the FIFA Code is closely aligned and modelled on the existing Australian State Legislation. Key provisions in which the State Acts vary, or the FIFA Code departs from the existing State legislation are discussed herein.

Definition of a Fertilizer

In the FIFA Code, a fertilizer is defined as any substance containing one or more of the recognized plant nutrients which is used for its plant nutrient content and which is designed for use or claimed to have value in promoting plant growth or supplying nutrients to plants that promote the growth or health of grazing animals, except:

- unmanipulated animal or vegetable manures , humus, seaweed or other organic waste; and
- sewage biosolids;
- lime, dolomite and natural gypsum when sold for soil amelioration only with no claims for the nutrient value of calcium, magnesium or sulfur.

Use Directions

Unlike agricultural chemicals where a specific application rate is prescribed, fertilizers supplement the soil and biological systems in meeting crop and pasture demands for plant nutrients. Because the rates and times at which fertilizers are applied are influenced by such factors as soil fertility, nitrogen fixation, climate, the crop being grown and the expected yield, it is impossible to give comprehensive use directions on a fertilizer label to cover all situations in which the product may be used. In addition, farmers and graziers are encouraged to use soil and plant tissue analysis, and seek the advice of fertilizer suppliers, consultants or Departmental Agronomists or Extension Officers when determining appropriate fertilizer rates.

Only one State, Victoria, requires a statement on the intended use of the fertilizer. This can be brief, e.g. "tobacco fertilizer" or "lawn fertilizer".

As fertilizers are sold in other States without mishap, this requirement is considered superfluous. Use Directions or Statements of Use are not required under the FIFA Code. Provision of such information on the label will be left to the discretion of the supplier. The Code outlines minimum label requirements. Members will not be precluded from including additional information, such as basic Use Directions, if they desire.

Minimum Nutrient Content

The minimum concentrations below which nutritive value cannot be claimed for the micronutrients in solid fertilizers have been amended, mostly upwards. The new figures are closely modelled on those used in North America. The minimum concentrations for micronutrients specified by the Association of American Plant Food Council Officials (AAFPCO) for all fertilizers except those prepared for hydroponic or continuous liquid feed programs are 0.1 % iron; 0.05 % copper, manganese, and zinc; 0.02 % boron; and 0.0005 % cobalt and molybdenum.

Declaring very low concentrations of micronutrients on product labels can create false impressions in the minds of users on the ability of a product to prevent or correct a nutrient deficiency. This particularly applies to soil applications of iron, which is quite abundant and readily fixed in soils. Often the concentration of micronutrient declared on the label reflects no more than the amount of the element present as an impurity in the raw materials from which the fertilizer is made, and is of doubtful agronomic benefit.

Silicon (Si) has been added to the list of essential elements, given recent research in sugarcane in Australia showing significant responses to this element. As uptake of silicon by grasses can be high, rivalling that of nitrogen, potassium and calcium, it has been treated as macronutrient. The minimum silicon concentration in solid fertilizers that can be declared on the label has been set at 0.5 % Si.

Table 1: *Minimum nutrient concentrations (%) required to be present before nutritive value can be claimed under the FIFA Code, and minimum concentrations or range in minimum nutrient concentrations in existing State legislation (all States except SA).*

NUTRIENT(S)	**SOLIDS (%)**		**FLUIDS (%)**	
	STATES	FIFA	STATES	FIFA
N P K S	0.5	0.5	0.1 – 0.5	0.1
Ca Mg			0.01 – 0.5	0.01
Si	-		-	-
Fe	0.01	0.1	0.005 – 0.01	0.005
Mn		0.05	0.001 – 0.005	
Cu Zn	0.005			
B	0.001 – 0.005	0.02		
Co	0.001	0.001	0.001	0.001
Mo				0.0005
Se				-

Heavy Metal Impurities

The maximum limits for heavy metal impurities in the FIFA Code (Table 2) are primarily based on the statutory limits enacted in Qld in 1997. These figures have subsequently been adopted by a number of other States. Changes include:

- The maximum cadmium (Cd) concentration in phosphorus fertilizers (> 2 % P) has been reduced to 300 mg Cd/kg P, in line with an undertaking to Government for such a change to take effect from 2001.
- The maximum mercury (Hg) concentration in phosphorus fertilizers in the FIFA Code has been increased from 5 mg/kg Hg to 10 mg/kg Hg, to allow greater flexibility in the future in the choice of phosphate rock for the manufacture of low cadmium fertilizers. Some new sources of phosphate rocks from China are exceedingly low in cadmium, but are higher in mercury than traditional sources.

Table 2: *Maximum Concentrations (mg/kg unless otherwise denoted) for Heavy Metals in Fertilizers under the FIFA Code and the range in existing State Legislation.*

ELEMENT	FERTILIZER	STATES	FIFA
Cadmium (Cd)	Phosphorus Fertilizer (mg/Cd/kg P)	350 - 500	300
	Non-phosphorus macronutrient fertilizer	10 - 80	10
	Micronutrient fertilizer	50 - 80	50
Lead (Pb)	Macronutrient fertilizer	100	100
	Macronutrient fertilizer with added micronutrient	500*	500
	Foliar-applied micronutrient	500 - 2 000	500
	Soil-applied micronutrient	2 000	2 000
Mercury (Hg)	Phosphorus fertilizer	5**	10
	All other fertilizers	5	5

* This limit applies to zinc enriched fertilizers only in Queensland. For other micronutrient enriched fertilizers, the maximum limit in Qld is 100 mg/kg Pb.

** In Western Australia, the maximum limit for mercury in phosphorus fertilizers is 50 mg/kg Hg.

The impurities content for fluid fertilizers will be the same as for solid fertilizers, when expressed on a dry weight basis.

Heavy Metal Warning Statements

Warning Statements are required in NSW, Vic, SA and Tas (in some instances) should the heavy metal concentration exceed that typically present in the soil as specified in the legislation, i.e. 1 mg/kg Cd, 20 mg/kg Pb and 0.2 mg/kg Hg. The Statement advises that continued use of the fertilizer may result in cadmium/lead/mercury residues in excess of the Maximum Limit in farm produce and may also result in soil accumulation of the element. The Warning Statement implies:

- Fertilizers are a primary cause of violations of food standards for cadmium, lead and mercury;
- That violations of the standards for lead and mercury in agricultural produce occur as commonly as they do for cadmium.

Unlike cadmium, very little if any lead and mercury is taken up by plant roots, and violations of the food standards for these elements in farm produce are rare. Should fertilizer derived lead or mercury enter the food chain, it is likely to be attributed to direct contamination with fertilizer or soil.

Some cadmium is taken up by plant roots. This cadmium may be derived from fertilizer, it may be inherently present in the soil, or it may come from other sources, e.g. atmospheric deposition in industrialized areas, or sewage biosolids. Many factors influence plant cadmium uptake, including soil acidity, organic matter content, cation exchange capacity, zinc status, salinity, irrigation water quality, crop species and variety, and fertilizer practices.

The FIFA Warning Statement comprises two parts:

- For cadmium, lead and/or mercury: "Use of this product may lead to an accumulation of cadmium/lead/mercury in the soil";
- Plus, for cadmium only: "and depending on soil characteristics, irrigation water quality, crop and variety, may interact to result in crop uptake in excess of the maximum limits allowed for cadmium in food standards. In pastures this uptake may result in offal exceeding the maximum limits for cadmium.

FIFA is taking an active role in the "National Cadmium Minimisation Strategy". Low cadmium fertilizers are being targeted at those areas/industries which have an existing or potential cadmium problem.

Fluorine

Existing State legislation (SA, Vic. and Qld.) specifies a maximum fluorine (F) content of 4.0 % F in phosphate rock and 2.5 % F in phosphorus fertilizers.

The legislation does not recognize that the P content of phosphorus fertilizers varies, e.g. from about 9.0 % P in single superphosphate (SSP) to 20 % P or more in triple superphosphate (TSP) and the ammonium phosphate fertilizers.

The fluorine content of phosphorus fertilizers marketed in Australia has increased over the past 20 years. This is attributable to changes in the source of phosphate rock, and efforts to reduce the cadmium content of finished fertilizers. Nauru phosphate rock, which was one of the more commonly used phosphate rocks, is relatively high in cadmium but low in fluorine compared to the phosphate rocks now being used to manufacture phosphorus fertilizers for the Australian market. These days, most high analysis phosphorus fertilizers approach and sometimes exceed 2.5 % F.

Rather than regulate the maximum fluorine limit, the FIFA Code requires that the maximum fluorine content of phosphorus fertilizers (those containing in excess of 2.0 % P) be declared on the product label. This information, which is presently not available, will allow producers to take the fluorine content of fertilizers into consideration where necessary.

Until recently, it was not thought that the fluorine present in fertilizers posed any risk to plants, grazing animals or human health (unless fertilizer was incorrectly used for direct mineral supplementation of livestock or the fertilizer was inadvertently ingested, e.g. if grazed soon after top-dressing).

Recent investigations by CSIRO Land and Water (M McLaughlin, et al) suggests there may be an emerging risk of fluorosis in the Australian dairy industry.

Upon application, the fluorine in phosphorus fertilizers is fixed and mostly remains in the top-soil. Plant uptake of this fluorine is not high.

However, should grazing animals ingest soil with pasture, some of this fluorine may be solubilized by digestive juices and be absorbed into the blood stream from the intestinal tract.

This risk is greatest in the dairying industry where fertilization rates are high, and in permanent pasture where the fluorine applied in fertilizer remains near the surface, i.e. it is not diluted by cultivation to a greater depth. It seems Australia and New Zealand, which are very dependent on mineral fertilizers, are more at risk than Europe and North America. In intensive animal production systems in these overseas environments, the cattle are housed and farmyard manure is used to top-dress pastures, supplying phosphorus and other nutrients. Less fluorine is applied as fertilizer and less soil is ingested.

CSIRO Land and Water investigations suggest fluorosis in dairy cattle may emerge in as little as 50 years.

Research is needed to determine the bioavailability of fertilizer-derived soil fluorine once ingested by grazing animals, so that the risk can be quantified and appropriate management strategies implemented.

The fertilizer industry may need to investigate how the fluorine content of pasture top-dressing fertilizers can be reduced. An awareness program, similar to the Cadmium Minimization Strategy, may then need to be directed at those producers at most risk.

For the present, the following Warning Statements on fluorine will be required under the FIFA Code:

- <u>If the fluorine content exceeds 40 g F/kg P</u>: "Do not feed this product to livestock or use in stock feed mixtures".

- If the fluorine content exceeds 50 g F/kg P: "If top-dressing pastures, do not graze for 3 weeks or until after rain or irrigation is received.

Standards and Definitions

Reference to manufacturing method and minimum nutrient concentrations in commonly used fertilizers will be deleted from the FIFA Code. In Australia, and elsewhere in the world, fertilizers are manufactured to internationally accepted standards. There are adequate provisions in Consumer Protection Legislation to cover those instances where a supplier chose to misrepresent a product.

Sampling, Sample Preparation and Laboratory Analyses

Considerable variability exists in the procedures used for sampling, sample preparation and laboratory analysis of fertilizers, particularly the determination of phosphorus availability. A FIFA Working Party has been convened to review the existing methodology and recommend uniform national procedures. Once finalized, these will be incorporated into the FIFA Code.

Tolerances

Synthesized nitrogen fertilizers such as urea and ammonium nitrate, and potassium fertilizers are very consistent in their analyses. Phosphorus fertilizers are more variable in their analyses, reflecting the inherent variability in the analyses of the phosphate rock(s) from which they are manufactured, as too are NPK compounds. More variable again are blends or mixtures.

Australian agriculture is very dependent on blends, given the diversity in climate, soils, crops and cultural practices. Manufacturing, logistical and price or cost constraints demand that a limited number of high volume fertilizers be manufactured or imported into Australia in bulk. These can be sold separately or used locally as blend ingredients, e.g. urea, ammonium nitrate, CAN (calcium ammonium nitrate), ammonium sulfate, DAP (diammonium phosphate), MAP (monoammonium phosphate), TSP, SSP, MOP (Muriate of Potash), SOP (Sulfate of Potash) and potassium nitrate. Blends are necessary to allow a wide range of fertilizers to be supplied, and are becoming increasingly important as farmers seek tailor-made "custom blends" or "special mixtures" specific to their needs, based on the results of soil and plant tissue analysis.

The tolerances in fertilizer analyses set by the States vary. In the case of blends, they are often exceeded. This is most likely to occur with potassium, and the micronutrients at low concentrations, i.e. less than 1.0 %. The existing tolerances are often within a standard deviation of the mean, given the variation that occurs with blends in sampling, sample preparation and analysis. The tolerances are unrealistically tight in the States of WA, Vic. and Tas.

In North America, there is a long history and considerable experience with blends. The Association of American Plant Food Control Officials (AAPFCO) has developed a series of formulae to determine Investigational Allowances (tolerances) for the various nutrients, as listed below. (A.A.P.F.C.O. Official Publication No. 45, 1992). A fertilizer is deemed to be deficient if these values are exceeded. The phosphorus and potassium formulae have been amended for use in Australia, where fertilizer analyses are expressed on an elemental basis. In North America, these formulae are based on the oxide analyses (P_2O_5 and K_2O).

- The nitrogen content is less than guarantee by an amount exceeding 0.88,or 0.44 + (0.014*guarantee), whichever is the lesser;
- The phosphorus content is less than guarantee by an amount exceeding 0.33, or 0.288 + (0.0013*guarantee), whichever is the lesser;
- The potassium content is less than guarantee by an amount exceeding 1.20, or 0.332 + (0.027*guarantee), whichever is the lesser;
- The sulfur, calcium or magnesium content is less than guarantee by an amount exceeding 1.00, or 0.20 + (0.05*guarantee), whichever is the lesser;

- The copper, iron, manganese or zinc content is less than guarantee by an amount exceeding 1.00, or 0.005 + (0.10*guarantee), whichever is the lesser;
- The boron content is less than guarantee by an amount exceeding 1.00, or 0.003 + (0.15*guarantee), whichever is the lesser;
- The molybdenum content is less than guarantee by an amount exceeding 1.00, or 0.001 + (0.30*guarantee), whichever is the lesser.

The AAPFCO Investigational Allowances recognize that the inherent variability in the analyses of fertilizers will depend on the nutrient and the concentration at which it is present. The use of formulae allows the tolerances to be determined on a moving scale. While the tolerance in absolute amounts reduces as the concentration falls, the tolerance as a percentage of that present increases.

With the primary nutrients (NPK), the Investigational Allowances are higher for nitrogen and potassium than for phosphorus. This reflects the higher nutrient content of the blend ingredients commonly used to supply nitrogen and potassium. Urea contains 46 % N, Muriate of Potash and Sulfate of Potash 50 % and 41 % K respectively, while the most concentrated phosphorus fertilizers contain a little over 20 % P. Less blend ingredient has to be used to achieve a designated N or K content than for P, resulting in greater variability.

These points are illustrated in the following tables (Tables 3 and 4)

Table 3: *AAPFCO Investigational Allowances (Tolerances) for Nitrogen, Phosphorus and Potassium.*

STATED ANALYSIS (%)	**NITROGEN (N)**		**PHOSPHORUS (P)**		**POTASSIUM (K)**	
	Variation from stated analysis (%)	Variation as a % of stated analysis	Variation from stated analysis (%)	Variation as a % of stated analysis	Variation from stated analysis (%)	Variation as a % of stated analysis
40	0.88	2.2	-	-	1.20	3.0
35	0.88	2.5	-	-	1.20	3.4
30	0.86	2.9	-	-	1.14	3.8
25	0.79	3.2	-	-	1.01	4.0
20	0.73	3.7	0.31	1.6	0.87	4.4
15	0.65	4.3	0.31	2.1	0.74	4.9
10	0.58	5.8	0.30	3.0	0.60	6.0
5	0.51	10.2	0.29	5.9	0.47	9.3
1	0.45	45	0.29	29	0.36	36

Table 4: *AAPFCO Investigational Allowances (Tolerances) for Micronutrients, at concentrations below 1 %.*

STATED ANALYSIS (%)	**COPPER, ZINC.**		**BORON**		**MOLYBDENUM**	
	Variation from stated analysis (%)	Variation as a % of stated analysis	Variation from stated analysis (%)	Variation as a % of stated analysis	Variation from stated analysis (%)	Variation as a % of stated analysis
1.0	0.11	10.5	0.15	15	-	-
0.5	0.06	11	0.08	16	-	-
0.05	-	-	-	-	0.016	32
0.025	-	-	-	-	0.009	34

For simplicity, rather than use formulae which give moving tolerances which vary with the nutrient and concentration, the FIFA tolerances have been simplified into a table. This has been broken up into more categories than presently used in the existing State Legislation (Table 5).

The FIFA tolerances are not too dissimilar to those presently enacted in Qld and NSW, and are modelled on the AAPFCO Investigational Allowances for nitrogen and potassium, and micronutrients at low concentrations (< 1 %). It is not practical to use more stringent tolerances in a simplified table, if key nutrients, e.g. potassium and molybdenum, are likely to consistently fall outside the tolerance levels, based on North American experience.

FIFA members have found as part of their internal quality control procedures that it is potassium which is most likely to fall outside the designated tolerance levels in blends.

The FIFA tolerances are framed with blends in mind. It is recognized that most straights and compounds will have little trouble complying with the FIFA tolerances, but given their uniformity, this is to be expected. The FIFA Code has not been prepared in the expectation that such products needed controlling.

Table 5: *FIFA tolerances in fertilizer analyses (as a percentage of the stated nutrient analysis), compared with existing State Legislation.*

FIFA CODE		**EXISTING STATE LEGISLATION**		
Nutrient Concentration (%)	Tolerance (%)	Nutrient Concentration (%)	WA, Vic., Tas. Tolerance (%)	NSW, Qld. Tolerance (%)
< 40	2.5	> 25	2	5
30 – 40	3.5			
20 – 30	5	10 - 25	4	6
10 – 20	7			
1 – 10	10	< 10	10	10
< 1 (except Mo)	15			
< 1 (Mo)	30			

References

A.A.P.F.C.O. (Association of American Plant Food Control Officials) Official Publication No. 45 (1992), published by AAPFCO, Inc. West Lafayette, Indiana, USA.

McLaughlin M, Stevens D, Keerthisinghe D, Cayley J, and Ridley A (2001) 'Contamination of soil with fluoride by long-term application of superphosphates to pastures and risks to grazing animals' Aust. Jnl. Soil Research, Vol 39 No. 3 pp 627-640