

NOP PETITION PROCESS.

A NEW PETITION

on

AMMONIUM CITRATE

highlighting

AN APPEAL AGAINST A PREVIOUS NOSB DECISION.

Petitioner:

Robert G Phillip.

BE, MEngSc, BEc. Sydney University.

Sydney, Australia.

August 31, 2017.

Summary:

The technology concerning chelating agents and micronutrient chelates has been significantly misunderstood by NOSB in their response to a previous petition.

Major points:-

- The botanical objective is delivery of micronutrients to plants;
- Micronutrients have both an unchelated and a chelated form;
- Unchelated micronutrients are suitable in soils up to soil pH ~ 6.0 - 6.2 ; beyond this range they are ineffective due to precipitation ('locking up') of the required nutrient;
- Chelated micronutrients, on the other hand, are effective in soils as high as pH 8.5.
- The unchelated form is already approved on the National List; what is sought is approval for use of the formulating compound to transform the synthetic unchelated micronutrient to the synthetic chelated micronutrient;
- Chelating agents are salts of acids;
- The ground-truth of the whole situation is demonstrated with new information, namely the results from a field trial on wheat in a high pH soil in Australia; chelated micronutrients create a statistically significant increase in yield over unchelated micronutrients. The reason for this is summarised as "nutrient availability":-
 - An increase in soil pH by one pH unit lowers the availability of micronutrients by a factor of 100 (down to 1% of the original); even an increase as little as 0.5 pH units lowers the availability by a factor of 10 (down to 10% of the original); it is for these reasons that micronutrient chelates are necessary in high pH soils.

Technical Review:-

Use of a chelating agent to form a chelate involves three separate substance categories:-

acid ==> salt ==> chelate.

Detail on this simplified flow scheme is presented to demonstrate the origins of the NOSB misunderstandings:-

1. A suitable organic-chemistry acid (in this case 'citric acid') is neutralised by an alkali to form a chelating-agent-salt; when NOSB and NOP omit all reference to the use of an alkali, they are in significant error;
2. NOSB and NOP believe that an unneutralised acid can act in the same way as the salt of that acid; this is a false belief.
3. NOSB declined all opportunities to obtain a Technical Review on chelates and chelating agents from an external source. As a result, NOSB was restricted to using only the existing NOP documentation which, at that time, was itself deficient;
4. NOP Guidance document 5034-1 omits all reference to 'chelate', 'alkali' and 'soil pH'; in this situation, no guidance on the requisite technology is available to persons inexperienced with organic-chemistry; no amount of goodwill can overcome the absence of good information;
5. These facts help to explain the errors and faulty reasoning produced by NOSB in September 2016 on petitioned 'chelating agents' *ammonium citrate* and *ammonium glycinate*.
6. Meaningful communication was prevented by NOSB's adherence to erroneous documents; the 2 parties 'spoke past each other'; there was mutual incomprehensibility;
7. NOSB believed they were correct - but in following the lead from incomplete documents, they followed an incorrect path; NOSB went out on a limb - but they didn't realise it.

Throughout this document we identify omissions and errors in NOP's guidance documents, problems with chemical concepts, incorrect chemical classifications, internal inconsistencies and self-contradictory arguments:-

Extensive corrective actions are necessary and include :-

- recognition of the difference between a chelate and a chelating agent;
- recognition that a chelating agent cannot be an acid and that it must be a salt;
- recognition that creation of a chelated micronutrient involves the joining of an already approved substance on the National List (an unchelated micronutrient) with a chelating-agent-salt to form a double salt; it is the double salt which is termed the chelate;
- recognition of the need for neutralisation of an acid with a base to form the chelating-agent-salt;
- explicit approval of specific acids and bases ('alkalis') for the neutralisation reaction;
- recognition that the species and strength of acid and base are needed for accurate and reproducible neutralisation; hence the suitability for use of 'nature identical' acids and bases; use of these substances, in the circumstances of necessity, creates no challenge to organic-certification principles;
- Recognition of the special case of high pH soil; in this environmental circumstance, NOSB needs to assess both:
 - the effect of a substance on the environment, and
 - the effect of the environment on the substance; (in the petition the substance is a chelate resulting from combination of the petitioned chelating-agent-salt with an already approved un-chelated micronutrient).
- Accepting, for the purposes of OFPA:-
 - that the petitioned chelating-agent-salt "ammonium citrate" is intentionally joined to an unchelated micronutrient to form a chelated micronutrient;
 - that a chelate formed, as described, from the petitioned formulating compound will be intentionally added to high pH soil;
 - that this sequence of steps satisfies the classification "used in production".

Actions in the past to add unchelated micronutrients to the National List achieved **scalability** for organic-certified crop production.

The proposed addition to the National List of chelating-agent-salts will permit **chelated** micronutrients to be formed for addition to soil; use of chelated micronutrients achieves **universality** of organic-certified crop production, most notably in high pH soil.

Chelating agents and chelates enrich the National List; organic-certified crop-producers will be empowered, not diminished, by having approved access to chelates for copper, iron, manganese and zinc.

The previous "Petitioned Material Proposals" from NOSB about our petition should be taken down from the web.

Documents forming part of this petition.

1. Attachment 1 herewith and its 2 Addenda; Attachment 1 is an appeal document dated June 8, 2017; the 2 Addenda are dated June 17, 2017. These have been received already by NOP.
2. NOP website for Petitioned Substances; refer ammonium citrate and ammonium glycinate petitions and addenda.

A completed petition is forwarded herewith addressing all the clauses of NOP 3011:-

Item A.1: Which section of the National List?

Addition to clause 205.601.

Item A.2: OFPA category.

The category recommended by NOP is "Production aids".

Note:

There are 10 categories offered by OFPA under clause 6517 . c . 1 . B . (i).

None of these are entirely satisfactory for chelating agents or for chelates. It would be of advantage for OFPA to create an additional category for “micronutrients”, “chelating agents” and “chelated micronutrients”.

Item A.3: Inert ingredients:

- does not apply to this situation.

Item B.1: Substance Name:

Ammonium citrate.

Function:

Ammonium citrate is a ligand or ‘joining material’ in the formation of a technically defined substance called a “chelate”.

A ligand, as suggested by its name, is a substance with ligature or joining properties.

Source of material:

Ammonium citrate is available on the open market as a solid; in addition, it can be manufactured as a liquid from suitable raw materials.

CAS Number: 3012 - 65 - 5

PubChem CID : 18954

Molecular weight : 226.

Technical review of Item B.1:-

We have decided to add a Technical Review at selected sites in this petition in order to assist NOSB from making the same scientific errors in this review as were documented in their previous review.

Synonym for ammonium citrate: ***ammonium salt of citric acid***

It is immediately clear from the synonym that the petition is dealing with a salt.

The definition of a salt is that it is the substance produced by neutralisation of an acid (in this case citric acid) with an alkali (in this case ammonium hydroxide).

For accurate neutralisation, the ‘degree of acidity’ as measured by the amount of hydrogen ion $-[H]^+$ needs to be exactly balanced with the ‘degree of alkalinity’ as measured by the amount of hydroxyl ion $-[OH]^-$.

Accurate neutralisation reactions require that the strength of a specific acid and the strength of a specific alkali be accurately known.

- ‘Nature identical’ acids and alkalis satisfy this requirement;
- ‘natural’ acids and alkalis do not.

The petitioned substance, termed a ***“ligand”*** or joining substance or chelating agent, is intentionally reacted in dilute solution with a metal salt to form a ‘chelate’; the choice is from the 4 metal salts already approved in clause 205.601, namely salts of copper, iron, manganese and zinc; these salts are classified as **“unchelated micronutrients”**. Once combined with a ligand or chelating agent, the unchelated micronutrients become chelated micronutrients.

It was not appreciated by NOSB or NOP [or OMRI] that chelating agents and chelates are in different, non-overlapping chemical classifications.

In summary:

- NOSB currently requires the use of ‘natural acids’; these, being heterogeneous as to species and variable as to degree of acidity, are not suited to the neutralisation task; nature identical acids and nature identical bases are so suited.
- NOSB omitted all reference to an alkali and thus excluded all reference to “salt”; NOSB claimed that acids on their own, namely fulvic acid and humic acid, were currently in use by organic growers to fulfil the same function as the ammonium citrate salt in this petition; this belief is untenable.

- NOP failed to distinguish the difference between a chelating agent and a chelate.
- It is stressed in this appeal that it is the chelate which is added to soil to solve micronutrient deficiencies and not the chelating agent on its own.
- Two of NOSB's 4 alleged chelating agents - fulvic acid and humic acid - are not chelating agents at all; it was an anomaly to include these substances when evaluating chelating agents.
 - One of the two remaining substances - lignosulfonate - does not form a chelate.
 - The last of the four accepted NOSB substances - citrate - is technically exactly the same as the petitioned chelating agent; was it wise to deny the petitioned substance for acceptance?
 - this petition requests, via 2 separate petitions, addition of ammonium glycinate as well as addition of ammonium citrate to the National List; both of these are synthetic substances formed by combining naturally occurring plant chemicals.
 - It is not clear why it was necessary for NOSB to suggest that two more chelating agent over and above the four alleged chelating agents are "not necessary for organic production".

Item B.2: Petitioner and manufacturer information.

Petitioner:

Robert G. Phillip.

BE, MEngSc, BEc. Chemical Engineer. Marketing Manager Alpha Chelates.

Manufacturer:

Alpha Chemicals Pty Ltd, 18 Inman Road, CROMER. NSW 2099. Australia. Phone + 61 2 9982 4622.

Item B.3 : Intended and current use:

The intended and current use of ammonium citrate is as a "ligand" in the manufacture of a "chelate".

Technical review of Item B.3:-

A ligand, when joined to an ionic salt of a micronutrient, produces a substance agreed to be called a "chelate"; the limitation to the use of the term chelate is that the ligand must form at least 2 bonds to the central metal ion.

Chelates are important for agriculture because they are successful in delivering micronutrients in high pH soil; in these soils, simple metal salts, such as are already approved on the National List, are completely ineffective.

- Chelates provide protection against precipitation in high pH soil of the electrically charged micronutrient-ion, e.g. Zn^{++} ; this is due to the extremely stable chemical bonding between ligand and metal salt, and this in turn limits the amount of zinc ion appearing as a charged ion in solution.
- The point is that precipitation of unchelated micronutrients in alkaline soils "locks-up" the micronutrient thereby removing it from soil solution from which plants derive nutrients essential for healthy growth.

Summary:

Chelates are not yet included in the National List or in Guidance document 5034-1; inclusion of chelates in these documents is part of the requisite corrective action.

The petitioned substance is combined with an un-chelated micronutrient-salt of copper, iron, manganese or zinc in a factory; these salts are already approved in clause 205.601. The resulting 'double salt' is termed a "chelate"; it is these that are added to high pH soils deficient in micronutrients.

Item B.4: Intended activities and application rate.

The application rate of chelating agents quantitatively follows the application rate of micronutrients and chelates to soil. For example:-

- Micronutrients of copper, iron, manganese and zinc are taken up by plants at a rate of 100 - 200 grams per hectare.
- The application rate of micronutrient chelates is of the order of two to three kilograms per hectare, assuming a metal content in chelates of 5% -10%.
- This means that chelating agents are applied at only a fraction of this rate, indicatively 1-2 kilograms per hectare;
- there is some variation between plant species but the point is made that application rates of chelating agents and chelates are very low.

Item B.5: Manufacturing process.

An acid-base neutralisation reaction is set up in a factory where exact, pre-calculated quantities of citric acid and ammonium hydroxide are introduced to a reaction vessel for neutralisation; the quantities used per batch vary depending on the regional market size, but an indicative reaction volume per batch lies between 50 - 200 litres; the point is made that reaction volumes per batch are generally low due to usage rates in the field being low. Naturally, if market conditions permit or if there is continuing high demand, reaction volumes can be of the order of 1,000 litres per batch.

The raw materials citric acid and ammonium hydroxide are chosen because the salt resulting from their neutralisation has the specific property of being able to act as a 'ligand' with the next raw material introduced to the reaction vessel namely the un-chelated micronutrient salt from clause 205.601. The product subsequently formed in the vessel, under dilute reaction conditions varying from factory to factory, is the chelated micronutrient which is the substance added to soil to solve micronutrient deficiencies in high pH soil. It is clear from this brief description that the former Crops Subcommittee of NOSB was in error in its use of substances claimed to be chelating agents; the Crops Subcommittee could not solve any micronutrient deficiency in any soil at any pH when it added the alleged ligand directly to soil.

Item B.6:

Ancillary substances - does not apply to this situation.

Item B.7: Previous reviews.

Previous reviews of the petitioned chelating agent are characterised by extensive documentation from the petitioner :-

1. Petitioner's document titled "Attachment 1"; this forms part of this petition; it is dated June 8, 2017 and has already been received and reviewed by NOP; it contains new information on chelating agents and chelates. Attachment 1 includes Addendum 1 and

Addendum 2 both dated June 17, 2017. Addendum 1 gives “new information” on families of chelating agents and it analyses the minutes of meetings of the former Crops Subcommittee in the period between May 4, 2017 and September 6, 2017. Addendum 2 contains 24 pages drawing together ‘new information’ including a pdf document containing the results of field trials on wheat grown in high pH soil in Australia.

2. Original petition dated December 2015 with 2 Addenda; these documents can be viewed on the NOP website under Petitioned Substances.
3. ‘Petitioned Materials Proposal’ by CS: September 6, 2016, available on the NOP website.
4. ‘Formal Recommendation from NOSB to NOP’; November 18, 2016, available on the NOP website.

Brief summary of the technical arguments involved:

NOSB introduced significant error in claiming that four presently allowed substances perform the same technical function as the petitioned chelating agent:-

- “Fulvic acid and humic acid;” these are acids; they therefore cannot be chelating agents which are salts. The National List categorises fulvic acid and humic acid as ‘soil amendments’, soil amendments are added directly to soil; they are not reacted with a micronutrient salt in a factory; the acids contain no micronutrients; they therefore cannot correct any micronutrient deficiency at any soil pH ; they cannot validly be used as a reason to disallow the successful chelating agents in our original petition.
- “Lignosulfonate;” this is a salt; in the National List it is classified under ‘soil amendments’; it is thus added directly to soil; no mention is made of it being joined to a micronutrient and then used to solve a micronutrient deficiency. If a lignosulfonate is in fact reacted with a micronutrient in an offsite-factory, there is no scientific evidence that the resulting “addition compound” performs any better in high pH soil than the simple sulphate salts themselves; lignosulfonate does not form a chelate and it cannot be validly used by NOSB to disallow the successful chelating agents in our original petition.
- “citrate;” the term indicates that this is a salt ; but it is missing a reference to the alkali; options for the alkali are sodium, potassium, calcium or ammonium; our petition contains exactly the same chemical moiety “citrate” and it does define the alkali source, namely ammonium hydroxide. NOSB comes to an illogical and self-contradictory conclusion when it decides that its undefined citrate is acceptable but that the defined petitioned citrate is not.

Item 8 : Regulatory Authority.

EPA information has not been found on ammonium citrate.

Item 9: Chemical Abstract Service (CAS) Number and Product Labels.

CAS Number: 3012- 65 - 5

PubChem CID : 18954

Molecular weight : 226.

No label is available for the liquid chelating agent substance ammonium citrate as there is not trade in it, as far as we know. The ammonium citrate we form and use does not exist at any time, in our case, except inside a reaction vessel in a factory.

Our proposed use of the liquid chelating agent is as a consumable intermediate substance in a role as a formulating agent. The process of formation of a micronutrient chelate occurs by combining the chelating agent with an already approved unchelated micronutrient salt; the resulting micronutrient chelate is applied to soil by organic-certified crop producers to solve micronutrient deficiencies in high pH soil.

Item B.10: Physical and Chemical Properties:

Chemical interaction with other substances:

Chemical interactions of ammonium citrate are intentionally controlled within a reaction vessel inside a factory. The ammonium citrate itself is formed in a neutral pH solution at a specifically selected dilute concentration suited to chelation reactions. Ammonium citrate does not exit the reaction vessel in which it is formed except after it has been chemically bonded to a micronutrient at which stage it is termed a 'micronutrient chelate'. In the event of a spillage from the reaction vessel, the chemical interactions would be unknowable as it does depend on other substances encountered nearby. In general, ammonium citrate is not highly reactive; quantities of spillage and concentrations in the spillage would be low in view of its manufacturing parameters; as ammonium citrate is completely water soluble, any chemical interactions can quickly be halted.

Toxicity and environmental persistence:

Ammonium citrate itself has a toxicity of minimal concern; this is indicated by the fact that it has not been studied by the National Toxicity Program (NTP). Ammonium citrate is not intended to exist outside the reaction vessel in which it is formed further removing any element of concern about its individual toxicity. The environmental persistence of ammonium citrate has not been observed as there is no justifiable reason to add it to soil; it is added to soil only **after** it has been combined with a micronutrient salt.

Environmental impacts from its use and/or manufacture.

Ammonium citrate is not added to soil as a pure chemical; it therefore has no environmental impact by itself. The environmental impact of ammonium citrate after it is joined to a micronutrient metal is positive, even essential, when planning the correction of micronutrient deficiencies in high pH soil. There is no environmental impact from its manufacture as ammonium citrate is not deliberately released into the environment. In the unlikely occurrence of spillage, during manufacture for example, we note that manufacturing volumes are low (normally less than 200 litres), that the concentration of ammonium citrate is low (less than 15% - 20% by weight) and that it is inherently composed of chemicals naturally formed in the environment namely, ammonium hydroxide and citric acid. Breakdown products in the environment are therefore of minimal concern.

Effects on human health.

In the unlikely event of spillage on skin, we note that ammonium citrate, as well as its reaction products such as micronutrient chelates, are completely water soluble and can simply be washed off with water. During contact time on the skin, there is minimal concern that damage to the skin will occur. The key point about ammonium citrate and its products is that it is not toxic to humans. We can conceive of no situation where humans would ingest the substance, because it is contained within a reaction vessel. With regards to human safety in general, we note that workers in industry are just as keen as all other workers to arrive home safely. Employers provide training courses for the specific materials being handled; they develop safe handling methods, safe working conditions and publish safety procedures; they encourage safety consciousness. When evaluating safety issues at NOSB regarding the petitioned substances, it should be remembered that we are dealing with experienced, properly trained and properly supervised workers and that substances should not be evaluated in isolation from the motivated humans handling them.

Effect on soil organisms, crops or livestock.

We can conceive of no situation where ammonium citrate, on its own, would be knowingly applied to either soil or crops or livestock. Once ammonium citrate is combined with a micronutrient metal salt the effects on soil organisms and crops can be said to be highly beneficial. We do not know the effect on livestock of ammonium citrate or of chelates based on ammonium citrate; farmers would usually segregate fertilisers and keep them in safe storage indicating that it would be very rare to have ammonium citrate or chelates based on ammonium citrate being ingested by animals in the field. We note that veterinary use of chelates for animals - and humans - does occur; this is especially the case for zinc and iron where chelates of these metals are used to correct deficiencies. We feel that, if chelate ingestion by humans is considered safe then there should be minimal concern about using chelates to correct deficiencies in soil used to produce organic-certified crops.

B.11: Safety Information from National Institute of Environmental Health Science.

An email from NIEHS dated 12 December 2015 states :

“Please be advised that the National Toxicology Program (NTP) has not studied ammonium citrate”.

It is safe to assume from this email that ammonium citrate, on its own, as well as ammonium citrate joined to an approved micronutrient salt in the formation of a chelate, is of minimal concern in terms of safety.

B.12: Research Information;

Technical Review:

The definition of a chelating agent is that it must be capable of forming at least 2 bonds to the central metal ion of a metal salt. The required 2 bonds are capable of being formed by polycarboxylic acid salts and by amino acid salts:-

- polycarboxylic acids eg citric acid and tartaric acid; the two requisite bonds are possible when two neutral carboxylic radicals —[COOH]^0 are altered to the negatively charged —[COO]^- by a neutralisation reaction with an alkali; removal of the proton —[H]^+ produces the negatively charged carboxylate ion and it is this negative ion which is ready to react with the positively charged metal ion in the micronutrient salt.
- amino acids e.g. glycine; with amino acids one bond is formed via the anionic oxygen ion in the negatively charged carboxylate group (as with citric acid) and the other bond comes via the non-ionic Nitrogen via unshared electron pairs in the $\text{—[NH}_2\text{]}$ group.
- It is clear that the neutral —[COOH]^0 carboxyl radical of an organic-chemistry acid such as citric acid or glycine **cannot** act as a ligand (ie form a bond) with the central metal ion; an acid cannot act as a chelating agent; a chelating agent must have the charged —[COO]^- ion and this requires the use of an alkali.

B.13: Petition Justification Statement.

Attachment 1 provides extensive discussion on Petition Justification. In addition:-

The synthetic substance is necessary for production of an organic product because an unchelated micronutrient is not effective in high pH soils whereas a chelated micronutrient is effective under those conditions.

NOSB claims that 4 separate substances are currently used as chelating agents. It is important to realise that NOSB are in error :-

- when they claim that *fulvic acid* and *humic acid* are chelating agents; acids cannot act as chelating agents; fulvic acid and humic acid are applied directly to soil as 'plant boosters'; it is anomalous to even include them in any consideration of this petition.
- when they claim that *lignosulfonate*, currently in use as a soil amendment, is capable of forming a chelate; any 'absorption compound' formed by combining the large molecule lignosulfonate with a simple metal salt will produce no better performance in high pH soil than the simple metal salt itself; what is needed is the protection provided by the strong bonds of a chelate and not the weak ionic binds provided by the large lignosulfonate molecule.
- when they rule that an un-specified 'citrate' is acceptable for organic production but that the petitioned 'ammonium citrate' is not acceptable; this is self-contradictory.

The original petition and Attachment 1 provide further discussion on Petition Justification.

S

NEW PETITION
with
AN APPEAL AGAINST A PREVIOUS DECISION.

Petitioner:
Robert G Phillip.
BE, MEngSc, BEc. Sydney University.

Sydney, Australia.
June 8, 2017.

Objective:

This document appeals a denial decision of the former Crops Subcommittee [CS] of the National Organic Standards Board [NOSB] in September 2016 dealing with synthetic chelating agents **ammonium citrate** and **ammonium glycinate**.

The formal Recommendation from NOSB to the National Organic Program [NOP] was published on the internet dated November 18, 2016.

Lodging an appeal:

Thank you sincerely to staff at NOP who have been courteously responsive for nearly 2 years; NOP have advised the required process for lodgement of an appeal against the denial decision mentioned above; and NOP have been advised, as early as May 8, 2017, that there is need for correction of errors and omissions in their documents regarding chelating agents and chelates.

Requirements regarding an appeal are:

- No specific form is needed for a new petition. *[NOP email May 20, 2017].*
- If substance has been previously reviewed and rejected by NOSB, then the new petition must provide information:
 - not submitted in an earlier petition, and/ or
 - not provided for in the previous Technical Reports for the substance. *[Clause 7, NOP 3011].*
- A petition may be submitted at any time. *[NOP email May 20, 2017]*
- Generic substances are eligible for petition; formulated (brand name) products are not eligible. *[clause 3.2, NOP 3011].*
- OFPA criteria considered by NOSB pursuant to #6518 :-
 - Clause (m) (6):- The alternatives to using the substance in terms of practices or other available materials;
 - Clause (m) (7):- Its compatibility with a system of sustainable agriculture. *[clause 3.5, NOP 3011].*

NOP PETITION PROCESS.

REQUEST FOR A REVIEW OF A PREVIOUS DECISION

BY

THE FORMER CROPS SUBCOMMITTEE [CS]

OF

THE NATIONAL ORGANIC STANDARDS BOARD [NOSB].

The original petition was accepted in December 2015.

The CS documented their denial decision on September 6, 2016

A document containing a request to reconsider the CS decision was received by NOP on June 12, 2017.

Addenda to the document received at NOP on June 12, 2017:-

Addendum 1:

Actual Notes of meetings of Crops Subcommittee, May 4 to September 6, 2017 with additional diagrams :

- Diagram 6 : Families of substances called chelating agents.
- Diagram 1: The missing technology.

Addendum 2:

"New Information" to be added to document already received by Dr. Lisa Brines on June 12, 2017.

Petitioner:

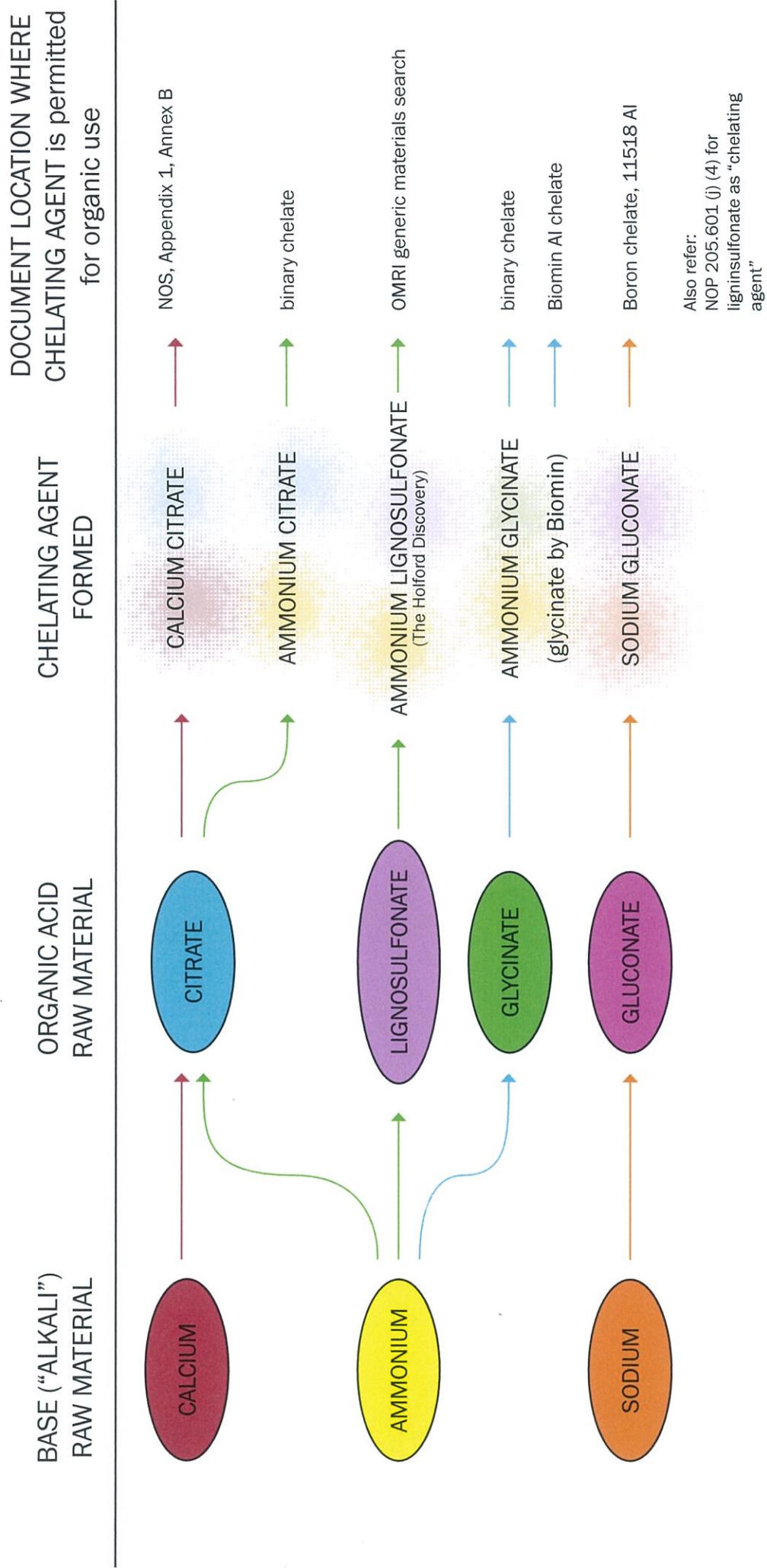
Robert Phillip.
BE, MEng.Sc, BEc.

Sydney. Australia.
June 17, 2017.

The attached document is Addendum 1.

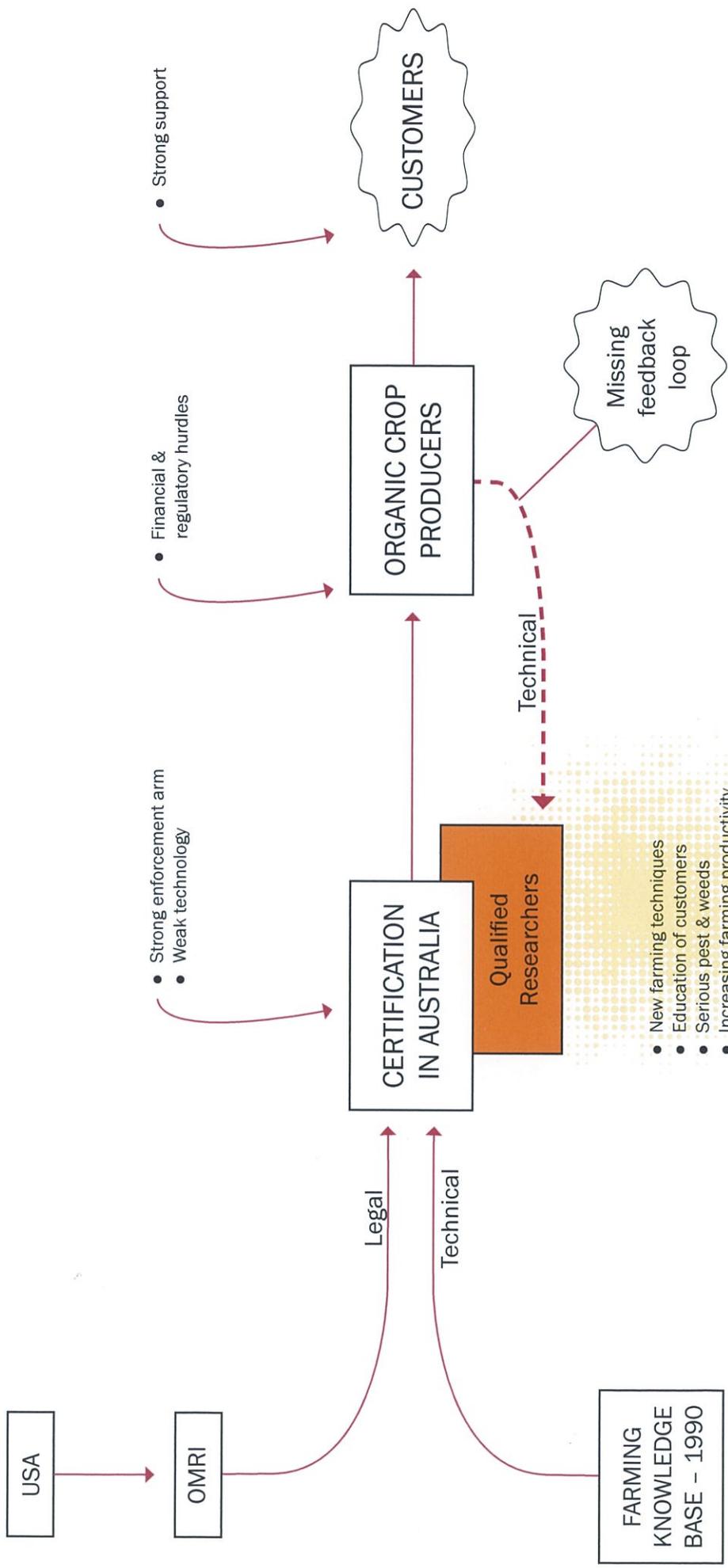
Diagram 6: Organic-certification for a Family of Substances called Chelating Agents

- Organic acids cannot form chelating agents
- Only NEUTRALISED organic acids can form chelating agents



Also refer:
NOP 205.601 (j) (4) for
ligninsulfonate as "chelating
agent"

Diagram 1: The Missing Technology



" CROPS SUBCOMMITTEE
MEETINGS" HELD MAY 4 - SEPT 6, ~~197~~ 2016. (4 MONTHS)

Ammonium citrate and glycinate (EO).

Petition sent to CS on 31/3/2016. TR request due by 31/5/2016.

1. CS meeting 4 May 2016.

Two new petitioned substances Ammonium citrate and Ammonium glycinate were submitted by the same petitioner.

A member noted that the wording in both was nearly identically except for the chemical name.

Emily Oakley offered to take the lead for these reviews.

The group will **determine petition sufficiency** and need for a TR on the May 17 call.

The CS Chair clarified for the new members **how to determine the need for a TR** (which was due at the latest by 31 May 2016).

2. CS meeting 17 May 2016

The lead noted that the two petitions are nearly identical.

Both substances are being petitioned for use as **chelating agents for fertilizers**.

The CS Chair asked if the petition included justification for why Ammonium citrate and Ammonium glycinate would be **better/preferred over what is already on the list, such as lignin sulfonate**. (This is added directly to soil).

The lead noted that the petition **did not include much information about why these are necessary**. This is because it was "CBI-deleted" !!

The group discussed whether or not to return the petition to the petitioner for justification, or whether to request a TR, and **chose the former**.

*ie decision was made against TR on 17 May 2016 **
The CS will include specific questions for the petitioner as to **why the current chelating agents are not sufficient** and will re-evaluate for sufficiency when it is returned; the addendum #1 arrived on 13 June 2016.

3. Petition Addendum #1 arrives at CS on 13 June 2016.

• attached as "Diagram 6: Families of substances"
• also attached is "Diagram 1: The missing technology!" R-Phillip June 18, 2017

4. CS meeting 5 July 2016.

This had available for consideration the Addendum #1.

The lead provided some background information on:

- the **definition of chelate vs. chelating agents**, and
- the group discussed **necessity and alternatives**.

The petitions were found sufficient. *on July 5, 2016*

The group will:

- move to a discussion
- vote on the August 2 call. *(The vote was ready on 5 July 2016).* *

5. The unsolicited petition addendum #2 arrived 25 July 2016.

6. CS meeting 2 August 2016.

The lead summarized the substances based on the information provided:-

- in the petition, and
- in the **"unsolicited" addendum sent by the petitioner.**

" " ?!"
The petitioner feels that the **definition on the National List (NL) for chelating agents is incorrect.**

A member noted that the definition is in the materials guidance and not on the NL.

The members discussed the chemistry of chelating agents and the role of acids and bases. !!

NO
The NOP acknowledged that the substances could be incorporated into the existing listing for micronutrients on the NL rather than under their own and separate listings.

The lead will **continue to work on the proposal**, with assistance from other Subcommittee members and the CS will discuss it on the next call.

Aug 16 meeting deferred. Aug 30 meeting deferred. *ie no discussion on petition occurred between Aug 2 & Sep 6.*

7. CS meeting 6 September 2016

One proposal with separate motions for each substance has been finalized. The lead discussed the substances.

The lead explained that the petition **does not supply sufficient reason for why these substances should be added** when there are other substances on the **National List that fulfil the same purpose.** #2 " "

The Subcommittee found that the addendum **did not completely discuss the question of alternatives.** " "

*2 what does that mean?
Robert Phillip Sydney June 17, 2017.*

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- Diagram 1: The missing technology.

Addendum 2:

"New Information" to be added to document already received by Dr. Lisa Brines on June 12, 2017.

Petitioner:

Robert Phillip.
BE, MEng.Sc, BEc.

Sydney. Australia.
June 17, 2017.

The attached document is Addendum 2.

Petition Addendum 2: “New Information”.

This data is supplied on June 17, 2017 as a petition addendum to Dr. Lisa Brines of NOP.

The data itself was initially included in a submission in July 2015 to the Senate Standing Committee on Economics of the Parliament of Australia; the topic was “*third party certification of food*”.

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1. Attachment 1 - **Agricultural systems using both feedback and feedforward controls.** pages 12A, 12B and 12C.
2. Attachment 4: **Case study : “Micronutrients and the Australian binary chelate”.** pages 12D, 12E, 12F and **pages 13-21.**
 - Attachment 4.1 - page 13 - Graph: Effect of soil pH on availability of micronutrients.
 - Attachment 4.2 - page 14 - Photo: Binary chelates on bananas in Nepal, March 2010 - April 2011.
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5. Attachment 7 - “GRO Organic”, USA. 2015. pages 22-23.
6. Attachment 8 - Diagram: Decision tree for use of chelated versus **un**chelated micronutrients. page 24.

Commercial in confidence.

"New Petition" & Appeal against
a denial decision by C.S. in Sept 6,
2016

APPENDIX 4.8

~~in the Submission to the Parliamentary Enquiry of third party
certification of food.~~

NEW INFORMATION

R. Phillip.

Certification document to OISCC (23 July 2015).

Micronutrient chelates.

• Addendum to
document received

Sydney
June 17, 2017

Permitted use in organic crop production.

by Dr. Lisa Brines June 12, 2017.

(Preliminary note:

This document has been prepared for OMRI in USA, as at 23 July 2015.

It is forwarded herewith to Mr. Ian King, President of OISCC at his request and it is planned to be considered by NSsC at their meeting in August 2015. The document could be sent to OMRI as it stands but the preferred option is to reach an agreed position between the Applicant, NSsC, ACO and NASAA so that the final document will represent an 'Australia-wide' consensus on technical details and thereby achieve greater impact in OMRI.

All technical details herein are 'commercial-in-confidence'.)

INTRODUCTION:

ALPHA CHELATES AUSTRALIA has been working towards organic certification of its innovative micronutrient chelates. These were invented and produced in Australia with, what we believe are, organic processes; these products have shown effective performance in commercial agriculture over the last 7 years; they have the potential to similarly increase organic crop yields, crop colour and crop quality parameters such as increased nutrient-density in cereal grains.

However, with omissions and basic definition errors in OMRI's documents, ALPHA CHELATES has not been able to secure this organic certification in Australia. This is because organic certification documents here mimic OMRI's approach and thereby repeat omissions and errors evident in USA.

Micronutrient chelates such as ours, termed 'The Australian binary chelate' and used for the micronutrients copper, iron, manganese and zinc, are an innovative new product and not widely understood. In fact, the whole topic of chelates is not widely understood, based on the evidence of organic-certification documents.

This document aims to address these misunderstandings and conceptual errors discovered in Organic Standards.

SUMMARY:

Our prior contact with OMRI in 2010 was inconclusive except for a documented demonstration from OMRI that it considers 'chelate' and 'chelant' as interchangeable terms. (See Appendix 1 herein). This error, and others, have cascaded into Australian

organic documents which aim to achieve 'equivalence' with OMRI; this maintains 'market access' for exports of organic-certified products.

In short:

- (i) Substances not allowed in OMRI are automatically not allowed in Australia.
- (ii) Substances omitted in OMRI are omitted in Australia.
- (ii) OMRI and Applicants such as ourselves have been speaking different 'languages' even when we use the same words.

Documentation created by previous chelate authors has completely ignored the need for a base ('alkali'); ignored the need for purity of acids and bases; ignored the need for a neutralisation step in producing a 'chelating agent'; confused the definition of chelant and chelate; created wrong beliefs. Because of this, we stress that adverse, hidden impacts unfortunately exist and that there is need to consult with authors experienced with 'organo-metal complexes' to review OMRI's clauses.

Throughout this report and in the Appendices, we stress that **knowledge-in-context** is vital; we must **know**; we must apply this knowledge in its proper context to derive positive consequences and benefits. Correct knowledge is needed to guide decisions on organic-certification, decisions which otherwise would be based only on ignorance, institutional preference or mere dogma.

Recommended actions which follow from our analysis are:-

- to develop a correct definition of 'chelate'.
- to develop a correct definition of 'chelating agent' (*chelant*).
- to accept the need for a 'base' (*alkali*) in the chelate production process.
- to include 'bases' (*alkalis*) in NOP 205.601.
- to amend NOP 205.601 by adding:
"..."**salts of sodium, potassium and ammonium hydroxide**"" in clause 205.601 (j) (6) (ii)
- to utilise NOP clause 205.600 which acknowledges that some substances (*such as pure amino acid and pure citric acid*) cannot be produced from a natural source.
- to adopt a simplified classification scheme for chelates using only 'natural' and 'manufactured' categories.
- to accept 'manufactured chelates' for organic crop production; these will utilise nature-identical raw materials and avoid petroleum-based raw materials.

- to adopt a ‘chelate language’ congruent with generally accepted meanings in chemistry, e.g. as per International Union of Pure and Applied Chemistry (IUPAC).

- to proactively cooperate with the “GRO Organic Program” in USA to support education about ‘organics’, marketing of the organic-concept and introduction of new farming technologies.

- to treat micronutrients with expanded expertise and skill; to acknowledge natural constraints for ‘delivery’ of them to plants in difficult soil conditions; to accept micronutrient fertilisers as essential in organic crop production despite the low uptake in plants of only **grams** per hectare and their expression in plant tissue in only **parts per million**. (Data on this topic is presented in Tables, Diagrams and photographs in Appendices).

- to recognise that the choice is between use of hypothetical, unworkable acids and bases from fermentation and *not yet used in chelation reactions* versus commercially pure raw materials readily available and already successfully used over 7 years in the manufacture of agronomically effective micronutrient chelates.

While the process of chelate formation can be looked at ‘on-line’, we have collected wide-ranging background data and present these in the attached Appendices. Of special interest is an analysis of the confused use of chelate language by OMRI in Appendices 1,2,3.

List of Appendices:

Appendix 1: The present situation. *pages 3-5.*

Appendix 2: Meaning of terms. *pages 5-7.*

Appendix 3: Illustrations of confusion and wrong beliefs. *pages 7-8.*

Appendix 4: Recommended Approach. *pages 8-9.*

Appendix 5: ‘Natural chelates’ and ‘manufactured chelates’. *page 9-10.*

Appendix 6: A quantitative context for micronutrients. *pages 10-12.*

Appendix 7: Plant uptake diagrams. *page 17: Diagram 4-5 page 16, Diagram 4-4*

Appendix 8: Photographs of plants showing symptoms of micronutrient deficiency. *page 15, photos ~~4-3~~ 4-3.*

*Robert Whitely
June 17, 2017*

Appendix 1. The present situation.

1.1 The example of lignosulfonic acid, calcium salt.

The ‘chelate language’ adopted by OMRI in the case of ‘*lignosulfonic acid, calcium salt*’ ‘proves the rule’ by following international usage:-

- NOP clause 205.601 (j) (4) classifies synthetic “*Lignin sulfonate*” as a “*chelating agent*”.

- OMR add, in their Generic Materials List:-

- ~ “...also known as lignosulfonic acid, calcium salt”.

This specific example shows that an acid (*here lignosulfonic acid*) is neutralised by a base (*here calcium hydroxide*) to form a salt (*lignosulfonic acid, calcium*

salt); this salt is termed a 'chelating agent'. Thus, all the necessary chemical terms have been used correctly by OMRI for at least one chemical species.

Synthetic acids (such as commercially pure glycine and commercially pure citric acid) are not allowed in NOP paragraph 205.601; but there, in that paragraph, other synthetic substances are allowed, including lignosulfonates. Exclusion of both synthetic amino acid and synthetic citric acid achieves exclusion of the very substances needed to be employed for reproducible neutralisation of a base (which itself is also excluded, as discussed below).

The "-ate" ending on "lignosulfonate" accords with international conventions ie acids ending in "-ic" form salts ending in "-ate".

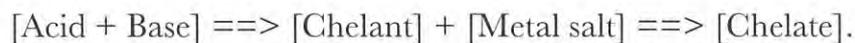
All the foregoing goes to show that OMRI does indeed adopt international conventions, but - as is shown herein - not in all.

This chosen example is notable for a second reason:-

OMRI possesses, and has exercised, discretionary powers; precedents already created are that some substances classified as 'synthetic' are not prohibited from use with chelated micronutrients in organic crop production.

1.2 Use of a common language.

To avoid misunderstandings, and to introduce a common language, we propose a simplified reaction process for the formation of a chelate:-

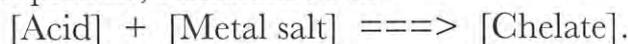


This is a 3-stage analysis in which:

- **acids and bases** are "raw materials" in the first stage.
- a **chelant** (or chelating agent) is an "intermediate product", an 'organic-chemistry salt' in the second stage.
- a **chelate** is the "finished product" in the third stage.

Detailed comments on these three species are given in Appendix 2 (next page). "Meaning of terms". (data attached). R.P. June 17, 2017.

In Appendix 3, it will be seen that that OMRI itself uses only a 2-stage reaction process, summarised as:-



No-one with chemical attainment would claim that this equation is accurate or has any relevance to organic crop production.

1.3 Identified shortcomings in OMRI's documents.

- There is no definition of 'chelating agent'.
- There is no recognition of the need for a 'base' ('alkali')
- There is no recognition of the need for neutralisation of acids and bases.

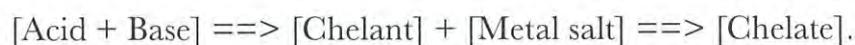
- There is no recognition that neutralisation needs to be accurately carried out by the use of chemically pure acids and bases to form an organic-chemistry salt (*the chelant*).
- The current definition of a ‘chelate’ is far from satisfactory.

Because of these specific points, the situation is ripe for confusion, misunderstandings and wrong beliefs as discussed in Appendix 3.

Appendix 2: Meaning of terms.

2.1 Chelate reaction sequence.

To avoid misunderstandings, and to introduce a common language, we document a simplified reaction sequence for the formation of a chelate:-



This is a 3-stage analysis in which:

- **acids and bases** are “raw materials”
- a **chelant** is an “intermediate product” formed as an organic-chemistry salt.
- a **chelate** is the “finished product”.

2.2 What is a chelate?

• A chelate is a ‘finished product’. It is formed from two salts, a metal salt and an organic-chemistry salt. (*see equation in Appendix 2.1*) It is a ‘value -added’ product enabling ‘delivery’ of micronutrients in a wider range of soil pH than technically possible with simple sulphate salts.

• The ion of a polyvalent metal salt must receive at least 2 chemical bonds from the chelant before the term “chelate” can be applied to the product. This is in line with the definition of a chelate used by the *International Union of Pure and Applied Chemistry (IUPAC)*.

• Because of the formation of (at least) two chemical bonds, chelates are very stable in their chemical structure. They are used in agriculture because they ‘protect’ the ionic form of the micronutrient metal (copper, iron, manganese or zinc - *essential for healthy plant growth*) from precipitation in any soil pH > 5.5-5.7. They are thus a secure ‘delivery system’ for micronutrients to plants.

• Chelates are part of the specialist field of organic chemistry known as “organo-metal complexes”.

• Chelates are irreversible to their raw materials and, because of a unique molecular stability arising from a 3-D bonding structure, they do not break down in soils and thus they show none of the properties of their raw material precursors.

- The use of nature-identical raw materials, as in our range of chelates, allows plant roots to immediately ‘recognise’ the substances involved, leading to rapid assimilation and circulation within the plant
- The distinction between the intermediate species “chelant” and the finished species “chelate” is vital.

[2.3] What is a chelant?

A chelant is an organic-chemistry salt.

A salt is formed by neutralisation of an acid and a base.

When used in the production of a chelate, a chelant must be capable of forming at least 2 bonds with the central metal ion; this is an International convention.

Alternative names used for chelant are *chelating agent*, *sequestration agent*, *sequestrant*, *complexing agent*, *complexor*, *binding material*, *ligand*. These all mean the same thing.

[2.4] What are suitable acids and bases to form chelants?

Organic-chemistry acids suitable for manufacture of chelants are amino acids such as ‘glycine’ and ‘polycarboxylic’ acids such as citric acid and tartaric acid.

Amino acids provide the necessary two-bonds to the central metal ion through an [N] atom and an [O] atom of their chemical structure, once the proton from the acidic group [—COOH] has been neutralised by a base.

Carboxylic acids work differently: they provide the necessary two bonds through two [O] atoms after the acidic groups [—COOH] have been neutralised by a base.

Chemical ‘bases’ suitable for neutralisation of amino acids and citric acid in this context are sodium hydroxide, potassium hydroxide and ammonium hydroxide. While *functionally*, any base may be used, it is preferred to use a base with a low molecular weight; this is so as to contribute the minimum possible weight to the reaction mixture thereby keeping the concentration of micronutrient in the final product as high as possible.

[2.5] What is neutralisation?

Neutralisation is a term used when an acid and a base are combined. Reaction proceeds to what is called ‘equilibrium’ where no trace of acid properties or alkaline properties remains.

Neutralisation needs to be done accurately and precisely because of the need to achieve a “neutral” solution. Hence, we need to accurately know the composition of each acid and each base used in chelate manufacture.

[2.6] Lignosulfonic acid, calcium salt; this example proves the rule.

A search within OMRI’s Generic Materials file, using ‘chelating agent’ as the search term, reveals an example which proves the rules discussed above:-

“*Calcium lignosulfonate:*

-*Synthetic.*

-*also known as “lignosulfonic acid, calcium salt.*

- *May be used as a chelating agent.”*

In this case, an acid (*namely lignosulfonic acid*) was neutralised by a base (namely calcium hydroxide) to produce a salt (*namely calcium lignosulfonate*); “*may be used as a chelating agent*”; all this accords with theoretical concepts outlined in Part [C].

The “-ate” ending on “lignosulfonate” accords with international conventions in that acids ending in “-ic” form salts ending in “-ate”.

All this goes to show that OMRI does indeed follow international conventions in some of its usages.

However, this example is notable for another reason:-

OMRI have exercised discretionary powers to create a precedent in which a substance classified as ‘synthetic’ is not prohibited from use with micronutrients in organic crop production.

Appendix 3. Illustrations of confusion and wrong beliefs.

- The current 12-word definition for chelate in the “Generic Materials List” is:- “*Chelates - Compounds that bind polyvalent metals at two or more cation exchange sites*”.

- The difficulty is that these words describe a chelating agent, **not a chelate**.

- The absence of an acceptable definition for chelate is the genesis of several ‘downstream’ problems in USA documents and, to our certain knowledge, in Australian documents as well. A correct definition would include the word ‘ligand’ as follows:

“*Chelate **Ligands**- Compounds that bind polyvalent metals at two or more cation exchange sites*”.

- “*... am still a little confused about the difference between chelant and chelate in the context of your question*”. [OMRI email 4 June 2010]. This confusion is directly traceable to the erroneous definition of chelate.

- “*...only nonsynthetic chelants (or chelates here in the US) are allowed to be used...*”. [OMRI email 5 June 2010]. A belief that ‘chelant’ and ‘chelate’ are interchangeable is again directly traceable to OMRI’s unsatisfactory definition of ‘chelate’.

- “*...Nonsynthetic chelates (including but not limited to non synthetic amino acids , citric acid,...)*”. [Generic Materials Search under ‘chelate’]. A belief that ‘chelate’ and ‘acid’ are interchangeable must be seen as totally incorrect. The sum total of OMRI’s treatment can be seen to be: Acid = Chelate = Chelant; this is not supportable in any way.

- As shown above, OMRI frequently uses the term “nonsynthetic”. Such a usage needs translation to achieve clarity; OMRI frequently resort to the explanation ‘*nonsynthetic ie natural*’. The use of ‘reverse language’ seems to offer little benefit in the chelate context.

- Definition of limit to OMRI’s activities.

Despite introducing several confusions, OMRI believes:- “*...At this point, it is outside OMRI’s scope to opine on efficacy or need for certain materials*”. [OMRI email 5 June 2010]. We believe that OMRI is well placed to use its authority and world-wide influence in an expanded educational role, especially when a high level of confusion exists. Such a role would proactively support proper use of plant nutrients with an added, new emphasis on micronutrients. Extended use of

micronutrients in organic crop production, when deficiencies are identified, would help to increase productivity and thus help to close the gap identified by *GRO Organic* between supply and demand for organic foods.

Concluding comments in Appendix 3 :-

- OMRI and ourselves as Applicants for organic-certification have been speaking different 'languages' even though we use the same words.

- OMRI has not perceived the need for a base or for a neutralisation step; as a consequence, OMRI has felt free to specify that only 'nonsynthetic acids' are permitted to be used for chelates; these are mixed acids produced from fermentation or hydrolysis; a random mix of acids results not reproducible as to species and always uncertain as % composition - and therefore difficult to neutralise accurately; we must be able to control and to reproduce chemical reactions in chelate formation.

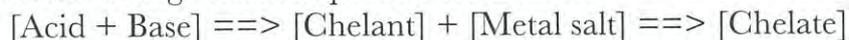
- Nothing, *no chemical reaction at all*, will result if OMRI were to mix nonsynthetic amino acids, or even nature-identical pure amino acids, with a metal salt. This predictable and absolutely certain non-event would seem to justify the revisions herein proposed. The belief that acids alone - and mixed acids at that - can act as chelating agents, is not a belief that would be held by any person with chemical attainment. Would OMRI retain its high transmissible reputation if it was widely known that an essential chemical step had been completely unrecognised since inception of OMRI's role?

- The authors of chelate clauses have not shown the same level of expertise as is evident in specialist clauses elsewhere in OMRI. Chelate authors have ignored the need for purity of acids and bases; ignored the need for neutralisation as a step in producing a salt; ignored the method of using the salt; confused the definition of chelant and chelate; created wrong beliefs. To continue to justify its reputation as International spokesperson on chelates for organic crop production, OMRI needs to accept that adverse hidden impacts currently exist and that there is need to introduce organic-chemistry qualified human resources to revise its documents wherever they deal with 'organo-metal complexes'.

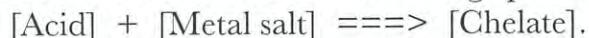
Appendix 4: Recommended Approach.

- Focus on the the need to know - in all aspects- especially in specification writing, in material purity, in chemical reactions, in use of fertilisers on the farm and in the need for continual replenishment of plant nutrients removed. These actions will mutually create a viable and sustainable system to create agricultural surplus.

- Focus on the 3-stage reaction process for chelates:



- and abandon the current inaccurate 2-stage process:



- Generate an accurate definition for both 'chelate' and 'chelant'.

- Recognise that allowance must be made for a 'base' in NOP Clause 205.601.

- Recognise that allowance must be made to use chemically pure acids and bases for neutralisation .

• (refer to the 3-stage process above and to Diagram 2 in the Submission to the Parliamentary Enquiry on third party certification of food.

• As a result, some conceptual revisions will become necessary in the face of practical organic chemistry; this applies especially to acceptance of 'nature-identical raw materials' for accurate, reproducible formation of 'chelants' in this specialist, limited field of micronutrient chelates.

We propose that the words "**...and salts of sodium, potassium and ammonium hydroxide**" be added to NOP clause 205.601(j) (6) (ii) and to other appropriate clauses throughout OMRI's Generic Materials "search" (eg under 'chelating agents').

Appendix 5. 'Natural chelates' and 'manufactured chelates'.

We suggest a simple classification of chelates along the following lines:

(i) '**Natural chelates**': These include haemoglobin (a naturally occurring chelate of iron) and chlorophyll (a naturally occurring chelate of magnesium). These are both large chemical molecules, well understood as 'organo-metal-complexes', without which human and plant life as we know it would be impossible. Many other natural chelates are formed from chelants resulting from microbial activity, degradation of soil organic matter and plant residues, as for example in compost. Root exudates are believed to also take part in chelating reactions; this can happen only to the extent that micronutrients and other essential substances are actually present. While only few naturally-occurring organic chelants have been identified, it is believed that humic acid and fulvic acid (ie specific chemical substances) are possibly involved in chelate formation. The chelate formation process requires the prior existence however - hardly ever mentioned - of a naturally occurring alkaline substance in the compost heap; an example is naturally-occurring ammonium hydroxide; such alkaline substances potentiate a natural neutralisation reaction to form the intermediate substance called "chelant" - itself not yet known as to chemical composition, or even isolated for analysis. Nevertheless, even without knowledge of specific chelants or operative chelates, gardens fed with compost are more likely to be receiving some, if not all, of the essential micronutrients needed by plants, because of the natural formation of chelates of the micronutrients.

(ii) '**Manufactured chelates**. In addition to using 'natural chelates', the other logical classification is 'manufactured chelates'. These may be classified into two sub-groups, namely those using nature-identical acids and those using petroleum-derived acids. The first sub-group includes those chelates formed by reaction between synthetic *but allowed* metal salts and synthetic *but allowed* chelants of amino acid and citric acid. The resulting wording in OMRI's paragraph in Generic Materials Search via "chelates" could thus read:

"Chelates: Manufactured, Allowed.

Chelates using the **sodium, potassium and ammonium salts** of amino acids, citric acid, tartaric acid and other di- and tri-carboxylic acids."

The addition of only 5 words (as above) to OMRI's documents would have far reaching and positive consequences, including:-

- increase in productivity of organic crop production.
- increase in micronutrient content of food grains grown under organic certification; that this is a desirable feature is indicated by the occurrence of cretinism, a disease traced to a lack of iron and zinc in cereal foods in many parts of the Indo-Gangetic-Plain and elsewhere around the globe.

APPENDIX 6. THE CONTEXT OF MICRONUTRIENTS.

We feel there would be advantage to have readily available a recital of relevant technical data on micronutrients and chelates because such data appears only diffusely in the literature.

6.1 Plant micronutrients.

The following table reveals the relative concentrations of the major nutrients and of the micronutrients in plants:-

N	1,000,000
P	30,000
K	400,000
<hr/>	
B	200
Cu	100
Fe	2,000
Mn	1,000
Zn	300

(Source: Havlin, J: "Soil Fertility and Fertilizers").

In view of the high ratio between concentrations of NPK and the others, there is clear justification in using terms such as "major nutrients" and "micronutrients", the latter term having largely replaced the use of 'trace metals'.

6.2 Nutrient removal rates.

The term "removal rates" is used to quantify nutrient uptake levels in the totality of crops, stems and leaves; this biological material is normally removed from the farm, either partially or wholly; nutrients removed must be replaced for sustainable farming, or otherwise a farmer is engaged in 'mining the soil'.

A brief selection is given below to demonstrate variability of removal rates, shown as kilograms or *grams per hectare* for several crops and nutrients.

Maize (3 t/ ha)

70 kg N, 10 kg P, 15 kg K,

12 grams Cu, 135 grams Mn, 40 grams Zn

Sunflower (1t/ha)

25 kg N, 4 kg P, 80 kg K
7 grams Cu, 30 grams Mn, 25 grams Zn.

Onion (6 t/ha)

11 kg N, 2 kg P, 12 kg K,
4 grams Cu, 36 grams Mn, 30 grams Zn.

Oranges (56 t /ha)

100 kg N, 11 kg P, 106 kg K,
34 grams Cu, 45 grams Mn, 80 grams Zn.

(Source: CSIRO, 2006 Edition, Australian Soil Fertility Manual).

Significant variations in removal rates are evident; nutrient replenishment rates need to be tailored; 'one-size-fits-all' is not an appropriate strategy

Note: The ratio of removal rates between major nutrients and micronutrients is of the order of *one thousand to one*, (1,000 / 1).

In view of the very low plant requirements for micronutrients, it is suggested that sympathetic attention be awarded to them in drafting OMRI clauses. On the one hand, they have a low consumption rate but, on the other, they are just as essential as the major plant nutrients in producing healthy plants and high plant yields.

6.3 The results of soil testing / The concept of "availability".

Some soil testing laboratories still use acid-extractable micronutrient soil tests. However, the "DTPA-extraction test" is preferred. Excellent correlations exist between DTPA-extractable test results and relative crop yields.

Here are the reported "DTPA-extraction" test results for 'marginal' and 'sufficient' soil levels for several micronutrients:

	Marginal (ppm)	Sufficient (ppm)
Copper	0.4 -0.6	> 0.6
Iron	2.6- 4.5	> 4.5
Manganese	< 1.0	> 1.0
Zinc	0.6 – 1.0	> 1.0

(Source: Havlin, *op cit*)

Discussion:

Micronutrient compositions of soil itself are of little importance in plant uptake due to several different chemical forms of the nutrient as pH changes.

"Availability" of micronutrients, as quantified by DTPA extractability, is the key.

Availability is generally high in acid soils; deficiencies are more common in alkaline or calcareous soils. Clearly, all available data about micronutrients

suggests that care - and knowledge - is needed within OMRI so as to give sensitive treatment to quantities as small as a few **parts per million**.

6.4 The results of tissue testing / The concept of reaching the 'critical range'.

Rapid nutrient analysis on fresh tissue could be important in diagnosing the nutrient needs of plants. Nutrient concentration in tissue can be a good indication of nutrient supply at the time of testing. From the result, it is possible to anticipate or forecast certain nutrient-related production problems while the crop is still in the field and while corrective action may still be implemented.

Here is data on **critical nutrient ranges** for the micronutrients *which must be reached* in 2 selected crops which would aid a grower in deciding to take corrective action:

	Maize (Third leaf)	Onion
	ppm	ppm
Boron	6 - 25	30-45
Copper	6 - 20	5 - 10
Iron	40 - 500	60 - 300
Manganese	40 - 160	50 - 65
Zinc	25 - 60	20 - 55

(Source: Havlin, *op cit*)

Appendix 7: Plant uptake diagrams.

(refer Attachment 4.4 in Submission to Parliamentary Enquiry on third party food certification). *page 16*

"Graphs: Threshold response & concept of limiting element".

Appendix 8: Photographs of plants showing symptoms of micronutrient deficiency. *page 15.*

(refer Attachment 4.3 "Photos: Deficiencies in boron, copper, iron, manganese and zinc")

in the Submission to Parliamentary Enquiry on third party certification of food.

Petition Addendum 2: "New Information".

This data is supplied on June 17, 2017 as a petition addendum to Dr. Lisa Brines of NOP.

The data itself was initially included in a submission in July 2015 to the Senate Standing Committee on Economics of the Parliament of Australia; the topic was "third party certification of food".

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6. Appendix 5 - "Natural chelates" & "manufactured chelates", pages 9-10.
7. Appendix 6 - A quantitative context for micronutrients, pages 10-12.
8. Appendix 7 - Plant uptake diagrams, page 12 and page 16.
9. Appendix 8 - Photographs of plants showing deficiencies of boron, copper, iron, manganese and zinc, page 12 and page 15.

List of Attachments. page 12 A

1. Attachment 1 - **Agricultural systems using both feedback and feedforward controls.** pages 12A, 12B and 12C.
2. Attachment 4: **Case study : "Micronutrients and the Australian binary chelate"**. pages 12D, 12E, 12F and **pages 13-21.**
 - Attachment 4.1 - page 13 - Graph: Effect of soil pH on availability of micronutrients.
 - Attachment 4.2 - page 14 - Photo: Binary chelates on bananas in Nepal, March 2010 - April 2011.
 - Attachment 4.3 - page 15 - Photos: Deficiencies in boron, copper, iron manganese and zinc.
 - Attachment 4.4 - page 16 - Graphs: Threshold response and concept of 'limiting element'.
 - Attachment 4.5 - page 17 - Photo: Threshold response of iron on sorghum. *Source: Havlin, page 322.*
 - Attachment 4.6 - page 18 - Table: "Removal rate" of micronutrients. *Source: Hamlin page 299.*
3. Attachment 5: NSW Government report on humic products, July 2012. page 19.
4. Attachment 6: Nepal and South-East Asia.
 - Attachment 6.1 - Nepal Agricultural Research Council. page 20.
 - Attachment 6.2 - Conference on micronutrients, Kathmandu. September 2004. page 21.
5. Attachment 7 - "GRO Organic", USA. 2015. pages 22-23.
6. Attachment 8 - Diagram: Decision tree for use of chelated versus **unchelated** micronutrients. page 24.

12 A

Organic-certified agriculture using both feedback and feedforward controls.

(see Diagram 4, attached). *Page 12 C.*

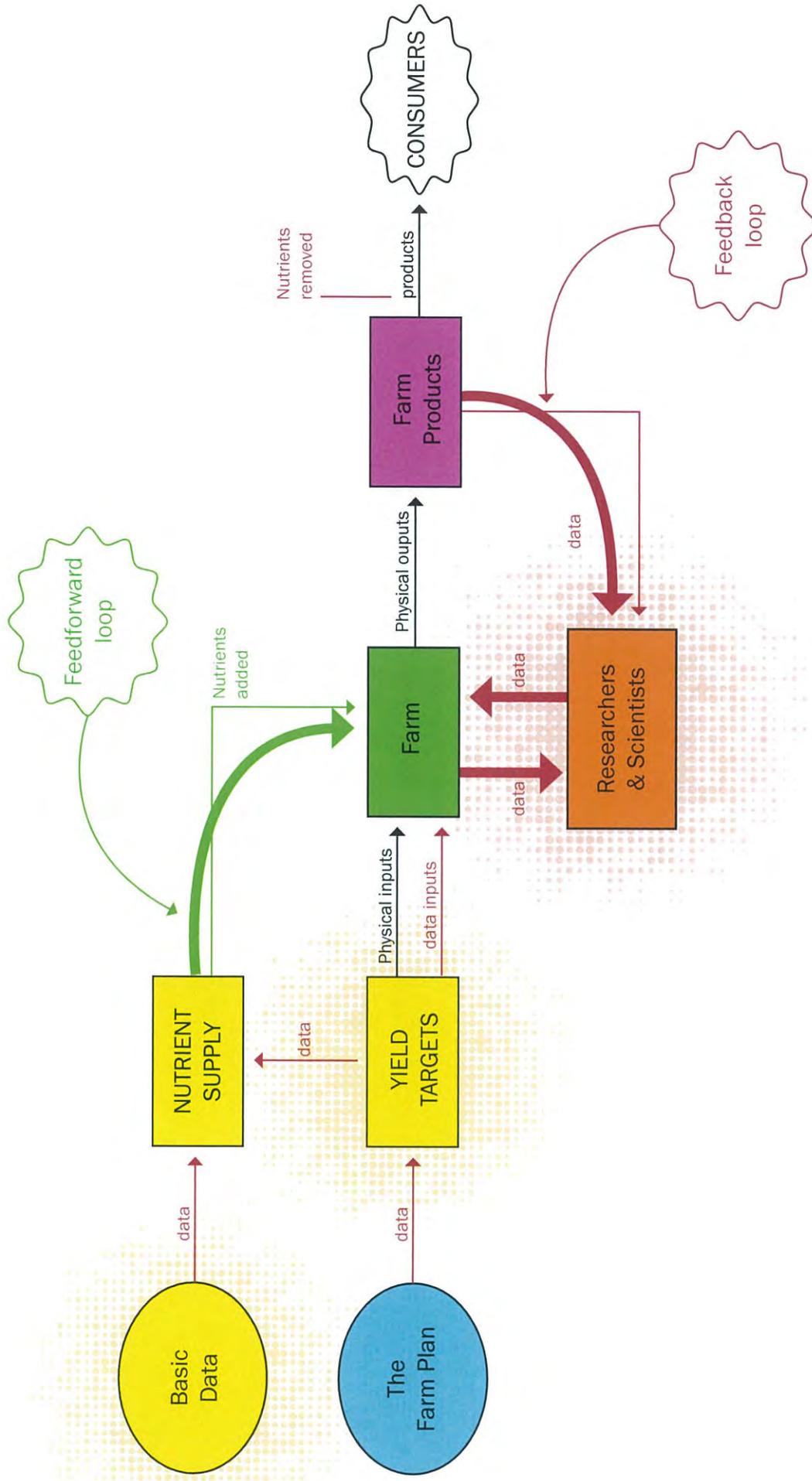
Diagram 4 contains:

- a feedback control loop (in red); this corrects for deviations.
- a feedforward control loop (in green); this helps to avoid deviations.
- a total of 8 separate streams for which 'data' is needed.

In sum, a sustainable organic-certified farm is underpinned by knowledgeable researchers and scientists ...and data; it also has a 'flying buttress' in a 'nutrient feedforward loop' which prepositions nutrients in soil.

- Feedback control combined with feedforward control always produces a better response than would have been achieved by feedback control alone.
- Organic Standards use both methods of control in their administration and clerical systems; that is why they are strong systems.
- Conversely, with technical and scientific matters, organic Standards use neither method of control; that is why they are weak technically; and that is why qualified scientists might not wish to be involved as employees - or advisers.
- Restrictions on nutrient supply are equivalent to omitting a feedforward loop.
- Absence of researchers, scientists and quantitative data is equivalent to omitting a feedback loop. (*Omit the feedback loop and 'Researchers' in Diagram 1 and view the effect*).
- Organic Standards operate without any of the technical/scientific apparatus customers have a right to expect.
- Low yields per hectare of organic produce result directly from the prohibition of use of modern plant nutrients (*in organic terminology 'synthetic substances' are prohibited*).
 - **here** is the cause of high costs of organic food per unit of output.
 - **there**, in Diagram 4, in the absence of a feedforward loop, is the genesis.
- Expressing support for modern plant nutrients says nothing about being against "organic matter"; on the contrary, a properly informed agronomist would be strongly in favour of organic matter in soil; **it is not 'either / or'..... it is 'both'** ie both organic matter and nutrients need to be used and controlled.
- Exactly the same questions asked in Diagram 4 about nutrients need to be asked for organic matter *on its own control Diagram:-*
 - what is the farm plan for organic matter in soil? (*in quantitative terms*).
 - what is the organic matter status at this particular site at sowing?
 - what materials are available to supply organic matter? (*'source'*).
 - how much should be applied per hectare? (*'rate'*)
 - when should it be applied? (*'time'*).
 - where should it be applied? (*'place'*).
 - what is the rate of transformation or loss of compost in soil?
 - what is the unit of measurement for organic matter equivalent to DTPA-extraction measurement used with micronutrients? (*see Appendix 4.4 and Section 6.3 in Appendix 4.8*)
 - where are the trained researchers and scientists who will guide the farmer, so that, after harvesting, the earth has not less organic matter than at sowing?
 - without insisting in its Standards that organic-certified farmers employ such a definite, disciplined feedforward and feedback control system for organic matter, the Standards are unconvincing - and exposed - as well as remaining voluntarily un-informed about modern plant nutrients. Diagram 5 (*attached*) drives this point home.

Diagram 4: Sustainable organic-certified agriculture



- Planned farming underpinned by Researchers & Scientists.. and data.
- Controlled farming via prepositioning or replenishing nutrients.

Attachments 4, 5, 6, & 7. & Decision tree for use of Chelated vs Un-chelated

APPENDIX 4, 5 and 6.

COMMENTS OF THE ATTACHMENTS 4.1 TO 4.8., and 5 and 6 and ~~Conflict Resolution.~~

and 7.

vs Un-chelated
Micronutrients

4.1 GRAPH. *page 13*

This graph shows the range of soil pH over which micronutrients remain 'available' to plants.

The Australian invented binary chelate, a "precision micronutrient" for which organic-certification is sought, is far to the right, indicating its stability in soil pH as high as pH 8.5-8.7. This is far superior to any micronutrient source on the graph.

4.2 PHOTOS by the author. *page 14*

These photo show the result of a field trial in Nepal on bananas, carried out by the author, using the Australian binary chelates, specifically boron, zinc and iron. The yield quodrupled, helped also by the correct addition of NPK (which would have made the bananas "non-organic").

4.3 PHOTOS FROM DPI NSW (DEPARTMENT OF PRIMARY INDUSTRY.) *page 15*

These photos verify the existence of micronutrient deficiencies in a wide range of crops.

4.4. GRAPHS. *page 16.*

These graphs and images testify to the depth of knowledge provided by science and agronomy in the production of foods. All nutrients exhibit a threshold response to addition of nutrient ie there is no point in adding more nutrient beyond a certain point. Libieg's Barrel shows that out of the 11 nutrients, one nutrient can be singled out as the 'limiting element' to higher yield; it is often a micronutrient missing in only grams per hectare that is the limiting element - hence not difficult to provide a correction. The graph on top left shows that for every one unit of pH increase he 'availability' of micronutrient decreases by a factor of 100; hence the need for chelates in soil pH above ~pH 5.5.

4.5 PHOTOS of response of sorghum to application of iron. *page 17.*

The photos, from page 322 of Havlin's Soil fertility and Fertilisers, show the threshold response in pictures. The DTPA measurements are not clear even in the book but they are (from the left) 1.5, 2.5, 3.5, 4.5. 5.0 ppm Fe measured as DTPA extractable. Note that after the 4 th from the left no deficiency of iron in sorghum is exhibited; we have reached 'sufficiency' for iron and it can no longer act as the limiting element.

4.6 TABLE OF REMOVAL RATES (source; p 299 Havlin). *page 18.*

This Table shows removal rates for various nutrients for a range of crops. It is exactly this data which an organic-certified farmer will need to use if he wishes to replenish nutrients removed in his crop, stems and leaves.

4.7 an 4.8 Documents shared with Australian certification agencies.

documents (not attached.) (Diagrams are.)

We have toiled to convince certification agencies of the technical error in OMRI - and because of 'equivalence' arrangements - in ACO as well. Diagrams 2 and 3 are the latest attempts to communicate in non technical language about the origin and impact of the error.

5. NSW DPI: Report on Humic Products, July 2012. *page 19*

attached page 12 E E attached page 12 E F

This report shows that there exists little scientific back-up to claims of efficacy for a whole range of new, alternative, fertilisers on the market.

6.1 and 6.2 Documents from Nepal. *pages 20 & 21.*

Government bodies interviewed in Nepal are keen to get our micronutrient chelates and modern agricultural technology.

The copy in 6.2 is of the cover from the 2004 Conference in Kathmandu on micronutrients.

(page 21)

~~Attachment 10: Conflict Resolution~~

- Attachment 7: "GRO Organic", USA, 2015.
- Decision tree: Diagram. Page 22-23.

*Robert Philip
June 17, 2017
(12D)*

Diagram 2: The correct 3-stage analysis for Chelate Production

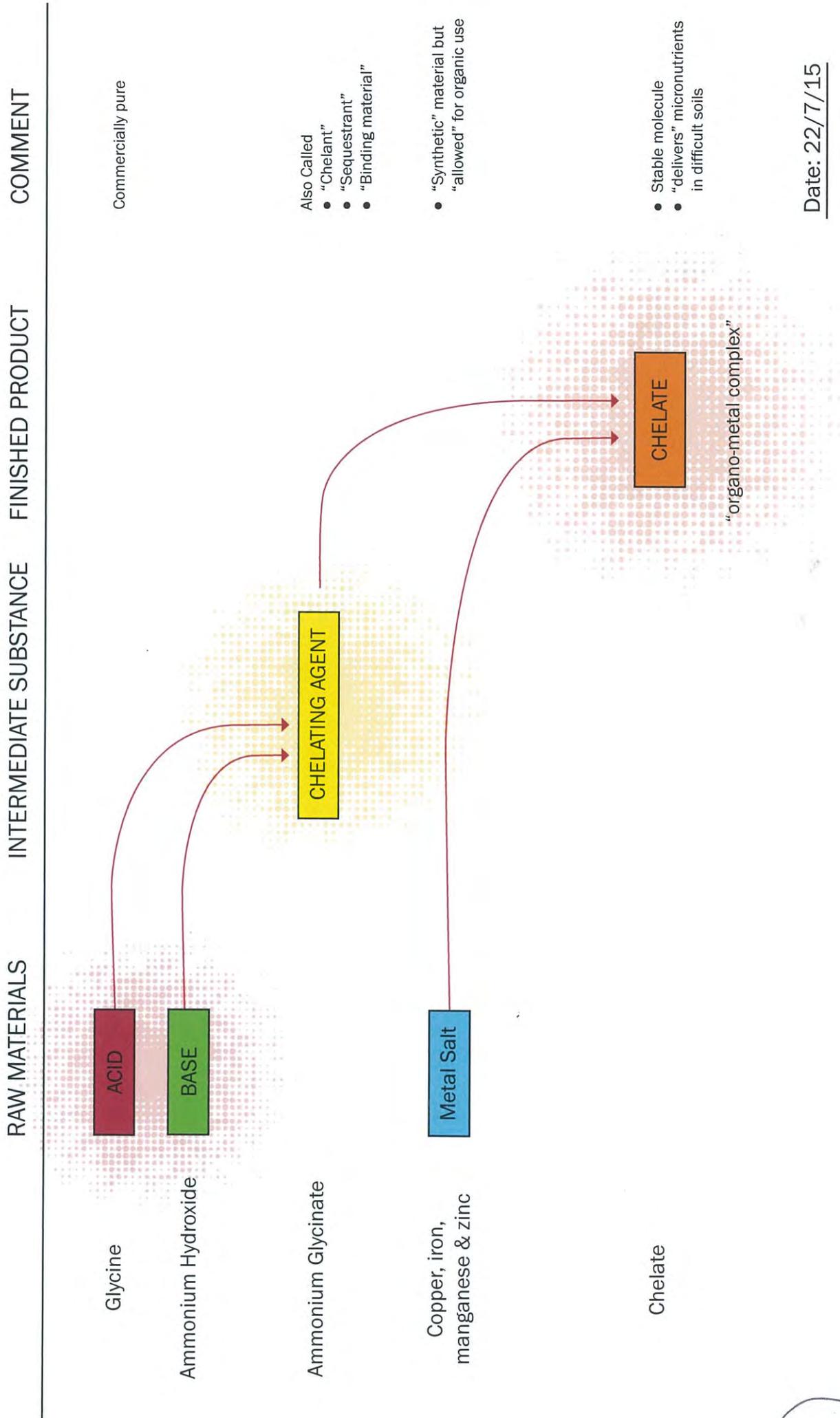
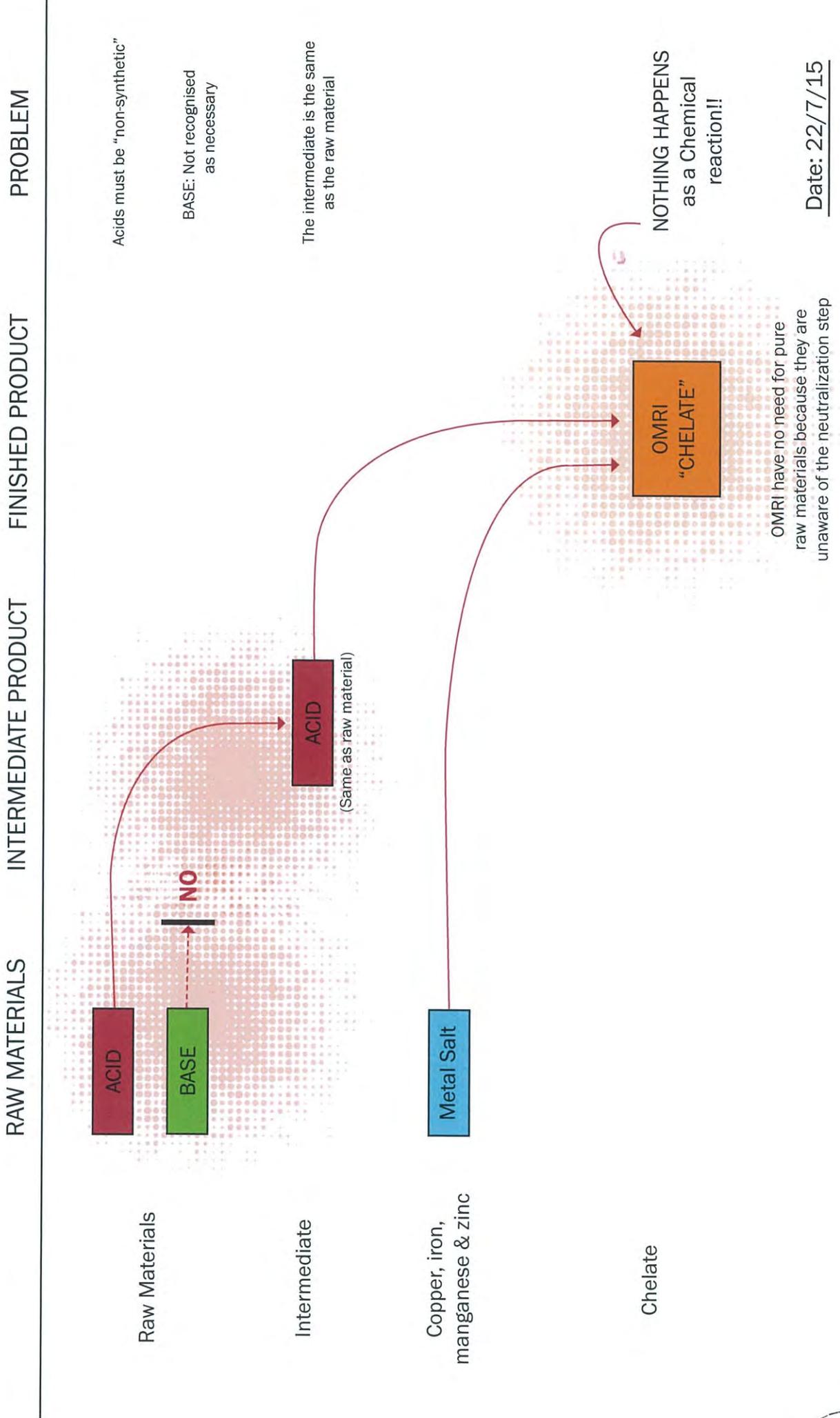


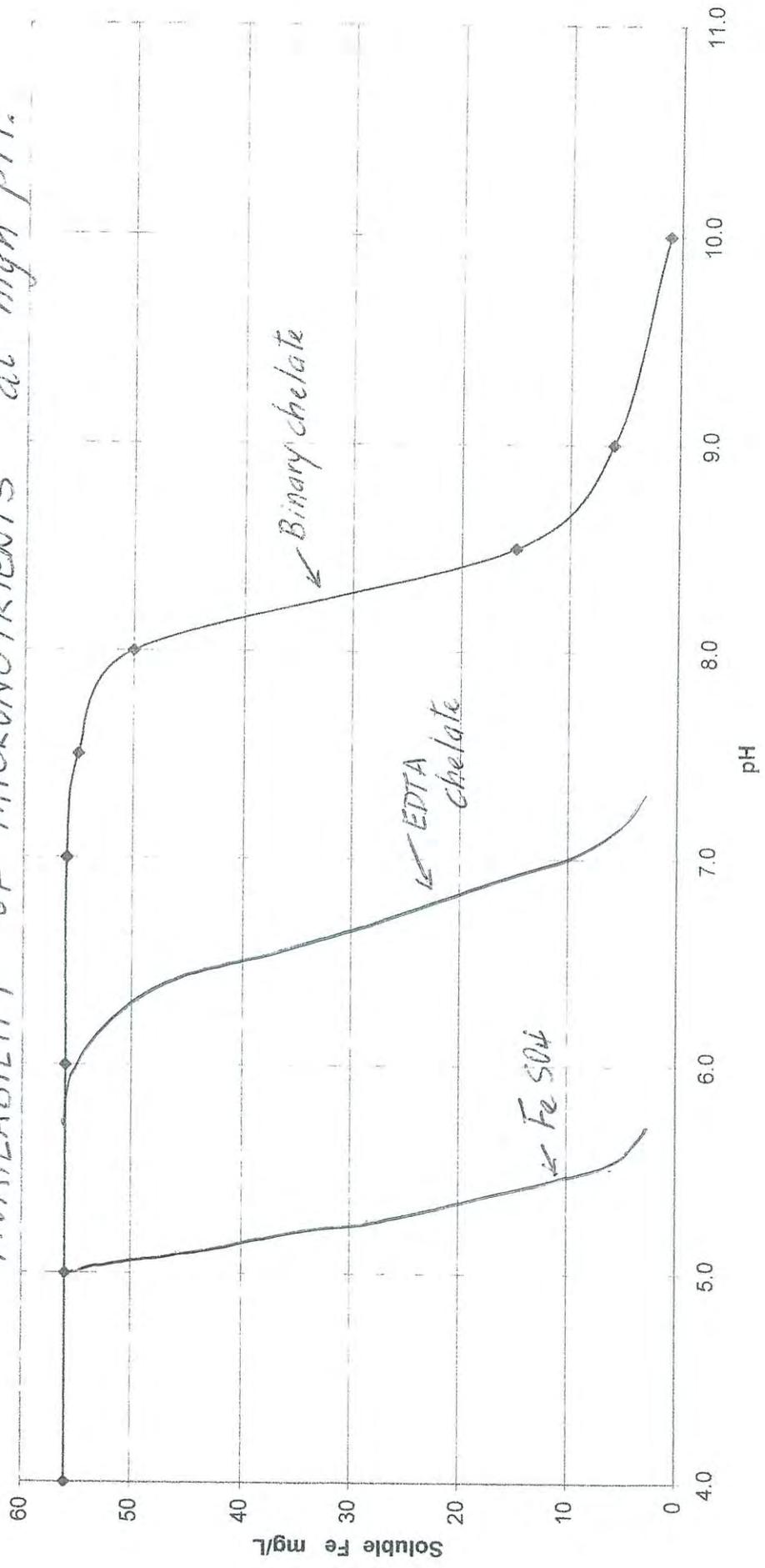
Diagram 3: Erroneous 2-stage analysis by OMRI for Chelate Production



APPENDIX 5.

Total Ferric Ions in Binary Chelate Solution
 1.0 Millimolar Solution
 Solubility Product of Ferric Hydroxide = 10×10^{-36}
 Stability Constant of Ferric Chelate = 10×10^{30}

AVAILABILITY OF MICRONUTRIENTS at high pH.



Free Ferric Ions in Binary Chelate

MICRONUTRIENT FERTILISERS APPLIED TO BANANAS IN NEPAL



(Test Period March 2010 - April 2011)

www.alphachelates.com.au



TYPICAL BUNCH FROM
UNTREATED GROVE



TYPICAL IMPROVED BUNCH FROM
TREATED GROVE

4.2



Cauliflower Boron Deficiency



Carrot Boron Deficiency



Canola Boron Deficiency



Lucerne Boron Deficiency

Boron

Boron is essential for the formation and transport of sugars in the plant. A boron deficiency first appears on the youngest leaves which turn pale green.

Older leaves are twisted, wilted or curled. Plants are stunted with cracking of fruit, tubers and roots, frequently with hollow areas or browning of the flesh. A boron deficiency occurs at < 20 ppm in mature leaves.

Alpha manufactures its own, world-first, liquid chelate at 2.0 % w/v B with no residues. The concentrate, on simple dilution with water, has fast release of boron nutrient in the plant, correcting deficiencies within a few days of foliar spraying.



Tomato Manganese Deficiency



Lettuce Manganese Deficiency



Sub Clover Manganese Deficiency



Cucumber Manganese Deficiency

Mn manganese

Manganese is essential for photosynthesis and root growth. A manganese deficiency exhibits on young leaves which turn yellow between green veins.

Leaves with yellow or grey speckle can appear. The result is reduced yield and poor harvest quality. Manganese deficiency occurs at < 20 ppm in the leaves.

Alpha manufactures its own formulation of liquid chelate at 5.5 % w/v Mn with no residues. The concentrate, on simple dilution with water, has fast release of manganese nutrient in the plant, correcting deficiencies within a few days of foliar spraying

alpha chelates

Precision Micronutrients

Chelates are soluble organic compounds containing strongly bonded metals. Chelating or "complexing" of metals increases their "availability" to plants.

Alpha Chelates do not use synthetic EDTA. We exclusively use organic plant compounds found in nature to produce the chelate. Our chelates are stable in all soils up to pH 8.2 and are ideal for hydroponics.

Fe iron



Tomato Iron Deficiency



Oranges Iron Deficiency



Grevillea Iron Deficiency



Tomato Iron Deficiency



Pea Iron Deficiency



Cucumber Iron Deficiency

Iron is essential for production of chlorophyll in the plant. An iron deficiency first appears in young leaves. These develop a yellowing between the green veins ('interveinal chlorosis').

Discolouration can progress to entire branches giving a characteristic yellow glow to the foliage. Eventually, leaves can turn white. Iron deficiency occurs at <20 ppm in leaves.

Alpha manufactures its own formulation of liquid chelate at 5.6 % w/v Fe with no residues. The concentrate, on simple dilution with water, has fast release of iron nutrient in the plant, correcting deficiencies within a few days of foliar spraying.



Maize Zinc Deficiency



Lettuce Zinc Deficiency



Citrus Zinc Deficiency



Beans Zinc Deficiency

Zn zinc

Zinc is essential for production of enzymes and amino acids which control plant growth. A typical appearance of zinc deficiency is narrow or pointed leaves with chlorotic or yellowing areas on older leaves.

A characteristic tufting or telescoping of small leaves at the end of shortened twig shoots creates 'leaf rosettes'. The result is retarded growth due to disturbed cell functions. Zinc deficiency occurs at <15 ppm in the leaves.

Alpha manufactures its own formulation of liquid chelate at 6.5 % w/v Zn with no residues. The concentrate, on simple dilution with water, has fast release of zinc nutrient in the plant, correcting deficiencies within a few days of foliar spraying.

4.3

Cu copper

Copper is essential for the formation of proteins and carbohydrates in the plant. A copper deficiency causes young leaves to become yellow and stunted.

Older leaves curl and there is dieback along leaf tips and edges. Flower production can fail. A copper deficiency occurs at < 5 ppm in leaves.

Alpha manufactures its own formulation of liquid chelate at 4.0 % w/v Cu with no residues. The concentrate, on simple dilution with water, has fast release of copper nutrient in the plant, correcting deficiencies within a few days of foliar spraying.



Grapefruit Copper Deficiency



Orange Copper Deficiency



Macadamia Copper Deficiency

ATTACHMENT TO SYMPOSIUM PAPER
"MICRONUTRIENTS: BACK TO BASICS: AND BEYOND"

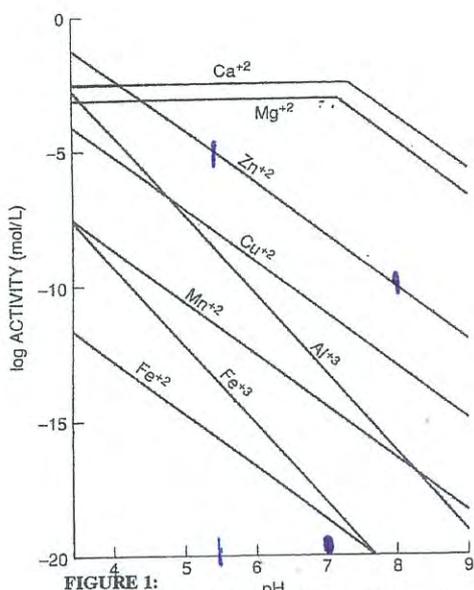


FIGURE 1:
Micronutrient availability declines with increase in pH

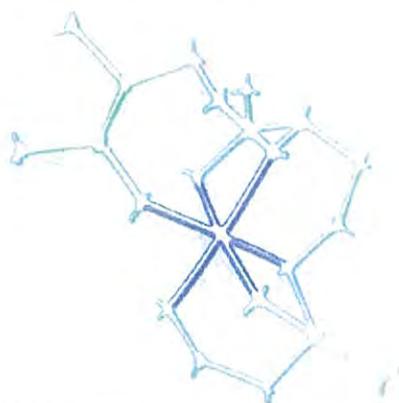


FIGURE 2:
Stereo model of a chelate showing 3-D bonding

FIGURE 7:
The varying rates & timing of nutrient uptakes

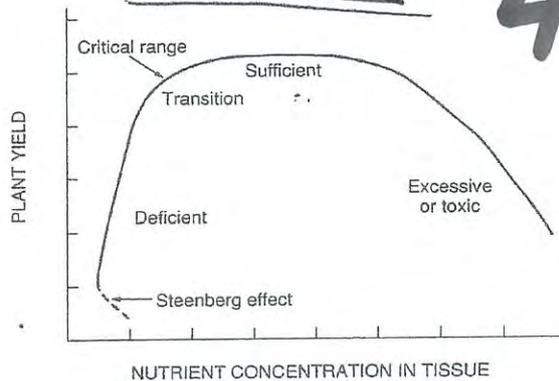
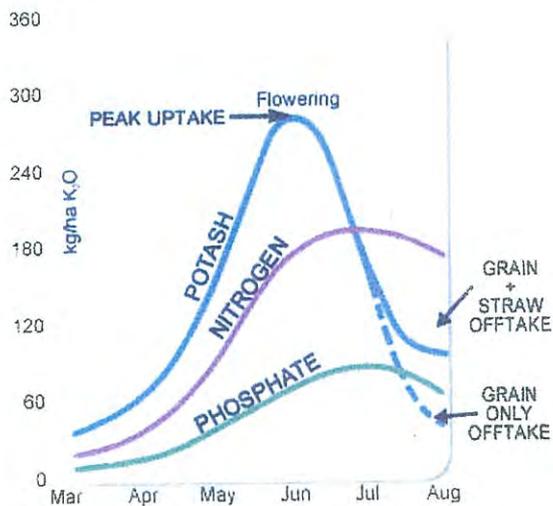


FIGURE 3:
Threshold response to nutrients & critical minimum concentration

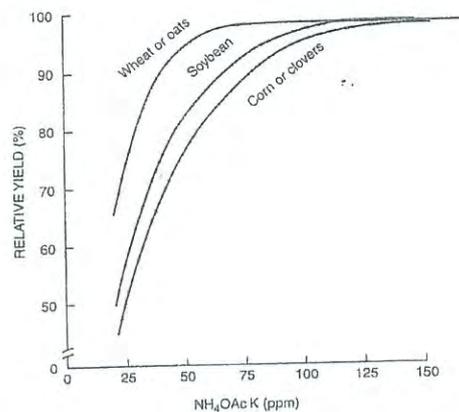


FIGURE 4:
Declining marginal rate of benefit from incremental potassium fertilizer

FIGURE 5:
Potassium is the limiting element in the lower curve

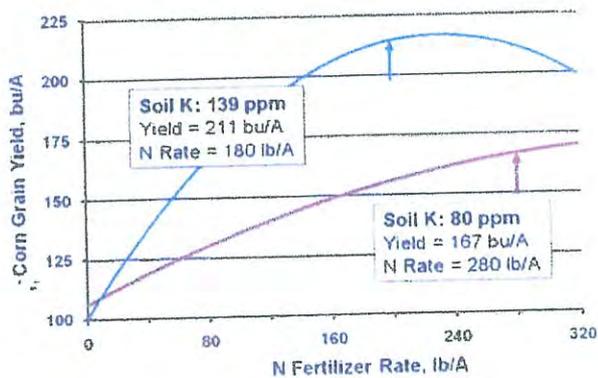


FIGURE 6:
Overall yield is controlled by 'the limiting element.'



HAVLIN :-

4.5

protein and soil-profile NO_3 content. Because temporal stability of this relationship is greater in regions where annual precipitation is < 750 mm, N application rates could be reduced in areas within fields that consistently exhibit high residual soil profile NO_3 . While areas of high-profile NO_3 content are likely due to either high N mineralization or low yields (low N uptake), grain protein distribution can be used to help delineate variation in N requirements within fields. Although grain analysis can be very helpful in N management, it is a postmortem analysis. However, monitoring grain protein for several consecutive years provides information that improves the accuracy in estimating N requirements.

Greenhouse and Field Tests

Greenhouse Tests

Simple greenhouse tests involve growing plants in small amounts of soil to quantify nutrient availability. Generally, soils are collected from a field suspected of being deficient in a specific nutrient. For purposes of calibrating soil and plant tissue tests, a wide range of soils that differ in nutrient availability are selected. Selected nutrient rates are applied, and a crop is planted that is sensitive to the specific nutrient being evaluated. Crop response to increasing nutrient rate can be determined by measuring total plant yield and nutrient content. Figure 9-22 illustrates the use of a greenhouse test to separate Fe-deficient and Fe-sufficient soils. Soils were selected to represent a range in DTPA-extractable Fe. Sorghum plants show decreasing Fe deficiency as DTPA-extractable Fe increases.

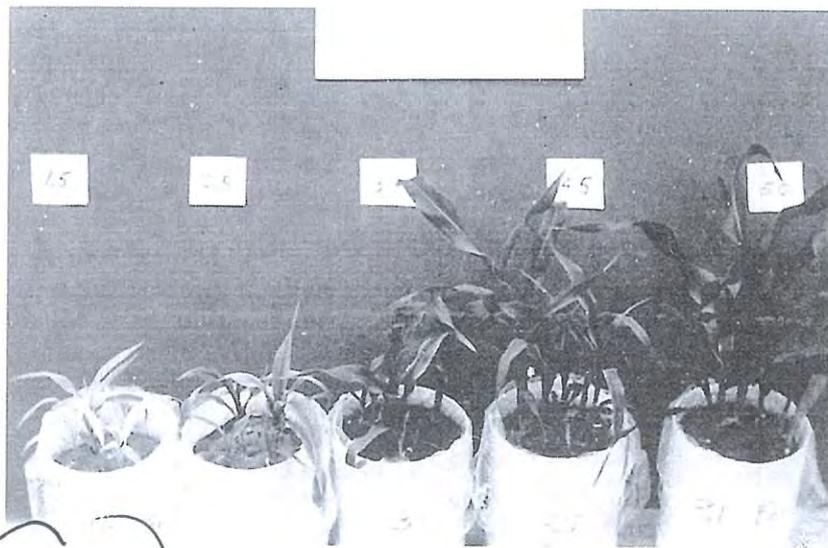


Figure 9-22. Greenhouse test used to evaluate the ability of DTPA to separate Fe-deficient and Fe-sufficient soils. Sorghum was used as an indicator crop. Fe stress in sorghum decreased with increasing DTPA-extractable Fe (ppm).

The photo is not clear in the book :-

↑
1.5 ppm Fe

↑
2.5 ppm Fe

↑
3.5 ppm Fe

↑
4.5 ppm Fe

↑
5.5 ppm Fe

$$2.47 \frac{ac}{ha}$$

$$\frac{lb}{a} \rightarrow \frac{kg}{ha} \times 1.12 = \frac{2.47}{2.2046}$$

HAYLIN
299

4.6

Table 9-1 Typical Nutrient Uptake Levels for Selected Agricultural and Horticultural Crops

Crop	Yield unit/a	N	P	K	Ca Mg S			Cu Mn Zn		
					lbs/a			lbs/a		
Grains										
Barley (grain)	48 lb/bu 60 bu 2880	65	14	24	2	6	8	0.04	0.03	0.08
Barley (straw)	2 ton	30	10	80	8	2	4	0.01	0.32	0.05
Canola	45 bu	145	32	100	—	—	28	—	—	—
Corn (grain)	200 bu	150	40	40	6	18	15	0.08	0.10	0.18
Corn (stover)	6 tons	110	12	160	16	36	16	0.05	1.50	0.30
Flax	25 bu	65	8	29	—	—	12	—	—	—
Oats (grain)	32 lb/bu 80 bu 2560	60	10	15	2	4	6	0.03	0.12	0.05 ~ 9g/t
Oats (straw)	2 tons	35	8	90	8	12	9	0.03	—	0.29
Peanuts (nuts)	2 tons	140	22	35	6	5	10	0.04	0.30	0.25
Peanuts (vines)	2.5 tons	100	17	150	88	20	11	0.12	0.15	—
Rye (grain)	30 bu	35	10	10	2	3	7	0.02	0.22	0.03
Rye (straw)	1.5 tons	15	8	25	8	2	3	0.01	0.14	0.07
Sorghum (grain)	80 bu	65	30	22	4	7	10	0.02	0.06	0.05
Sorghum (stover)	4 tons	80	25	115	32	22	—	—	—	—
Soybean (grain)	50 bu	188	41	74	19	10	23	0.05	0.06	0.05
Soybean (stover)	3 tons	89	16	74	30	9	12	—	—	—
Sunflower	50 bu	70	13	30	—	—	12	—	—	—
Wheat (grain)	60 lb/bu 60 bu 3600	70	20	25	2	10	4	0.04	0.10	0.16 ~ 0.18 kg/ha
Wheat (straw)	2.5 tons/ac 2.6 t/ha vp	45	5	65	8	12	15	0.01	0.16 ~ 0.18 kg/ha	0.05 ~ 0.06 kg/ha
Forages and Turf										
Alfalfa	6 tons	350	40	300	160	40	44	0.10	0.64	0.62
Bent grass	2 tons	230	22	100	—	—	—	—	—	—
Bluegrass	2 tons	60	12	55	16	7	5	0.02	0.30	0.08
Bromegrass	4 tons	140	22	180	—	15	15	—	—	—
Clover	6 tons	320	40	260	—	—	—	—	—	—
Coastal Bermuda	8 tons	400	45	310	48	32	32	0.02	0.64	0.48
Cowpea	2 tons	120	25	80	55	15	13	—	0.65	—
Fescue	3.5 tons	135	18	160	—	13	20	—	—	—
Orchard grass	6 tons	300	50	320	—	25	35	—	—	—
Red Clover	2.5 tons	100	13	90	69	17	7	0.04	0.54	0.36
Ryegrass	5 tons	215	44	200	—	40	—	—	—	—
Sorghum—Sudan	8 tons	320	55	400	—	47	—	—	—	—
Soybean	2 tons	90	12	40	40	18	10	0.04	0.46	0.15
Timothy	4 tons	150	24	190	18	6	5	0.03	0.31	0.20
Vetch	6 tons	360	38	250	—	—	—	—	—	—
Fruits and Vegetables										
Apples	500 bu	30	10	45	8	5	10	0.03	0.03	0.03
Bean, Dry	30 bu	75	25	25	2	2	5	0.02	0.03	0.06
Bell Peppers	180 cwt	137	52	217	—	43	—	—	—	—
Cabbage	20 tons	130	35	130	20	8	44	0.04	0.10	0.08
Onion	7.5 tons	45	20	40	11	2	18	0.03	0.08	0.31
Peach	600 bu	35	20	65	4	8	2	—	—	0.01
Peas	25 cwt	164	35	105	—	18	10	—	—	—
Potato (sweet)	300 bu	40	18	96	4	4	6	0.02	0.06	0.03
Potato (white)	15 tons	90	48	158	5	7	7	0.06	0.14	0.08

Wheat: grain + straw = 115 lb/ac = 128 kg N/ha } @ 4t/ha grain (continued)
 ✓ (0.16 to 0.25) = 0.21 lb/ac = 230 g Zn/ha

10.

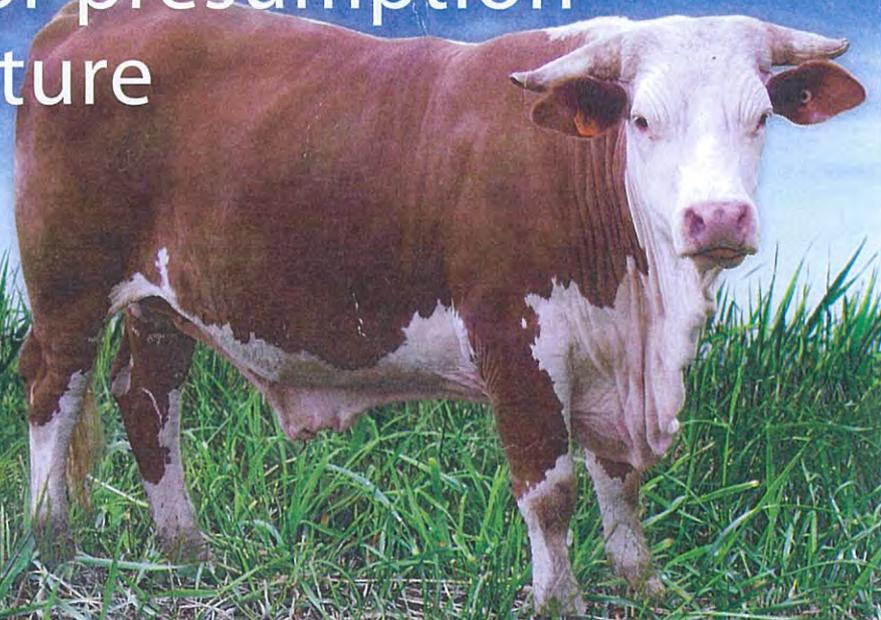


Department of
Primary Industries

Attachment 5.

Humic products

Potential or presumption
for agriculture



Kim Billingham (Project Officer – Agronomy) Taree
Livestock and Pasture Systems

19

A close-up photograph of dark brown soil. A white rectangular label is placed on the soil, with the text 'JULY 2012' written on it in black marker. The soil surface is covered with a pattern of white hexagons, likely representing a chemical structure or a sampling grid.

JULY 2012



Nepal Agricultural Research Council
Soil Science Division
Khumaltar, Lalitpur



A Brief Description
2004

Dr. Basant
6-1

NARC



A profile



NEPAL AGRICULTURAL RESEARCH COUNCIL (NARC)

NARC Building, Singhadurbar Plaza
P.O. Box 5459, Kathmandu, Nepal

February 2006



6.2



Micronutrients in South and South East Asia

Proceedings of an International Workshop held 8-11 September, 2004, Kathmandu, Nepal



Editors

Peter Andersen, Junoo K. Tuladhar, Krishna B. Karki, and Surya L. Maskey

21

(21)

ATTACHMENT 7.

“GRO Organic”, in USA , 2015.

The “Generic Research and Promotion Order for Organic” (*GRO Organic*) is a ‘Program’ commenced in USA in March 2015; it addresses three challenges in the organic industry today:

- domestic supply shortages for organic crops.
- research to develop viable pest management solutions.
- market confusion over what the brand means and what the consumer thinks it means.

Advocates of the 3 challenges ‘program’ seek approval from United States Congress to levy of 0.1% of net organic sales on organic producers, organic handlers and importers of organic products.

This will raise ~\$US 35 million of which only 15% will be spent on ‘administrative expenses’.

- We find it surprising that no mention at all is made of a 4th challenge, namely to raise productivity of organic farming; this is especially true when such a large sum is proposed to be available to tackle serious problems.

(i) **Domestic supply shortages** of organics in USA. Discussion is focused on:

- lack of organic farmers
- low supplies of organic feed grain
- restriction to organic dairy production
- lack of organic barley
- shortage of organic soybeans and organic corn for organic eggs
- reluctance of new entrants to transition to organic due to ‘various financial and regulatory’ hurdles.

Allowing for our very large pastoral acreage for organic meat, the above or similar comments would apply to Australia as well.

(ii) **Research for pest management solutions.** Discussion is focused on:

- insect problems in organic apples
- fire blight management in organic pears
- citrus greening, a current and serious pest management issue in future.
- more funding is needed to research better and more effective techniques and applications now that some synthetic pesticides have been mandated in California.

Allowing for differences in current cropping, the above issues or similar would apply in Australia as well.

(iii) **Market confusion.** Discussion focuses on:

- there is a disparity between what the ‘organic seal’ means and what the consumer thinks it means.
- consumers don’t know what the characteristics or regulation of organics are.
- consumers are unclear about the benefits.
- consumers easily confuse ‘organic’ with ‘natural’, ‘local’, ‘non-GMO’, etc.
- there is not enough public education about the ‘label’; the more choice of food labels, the more the confusion about what all of the labels mean.

The plan is to invest in educating consumers who are new to organic on what the organic label means, what the benefits of 'organic' are and what it means for the food to be 'organic'. "n short:

- "There is a strong need for a clear, unified message across for the entire industry to relay the organic message.
- The National Organic Plan [NOP] (and OMRI) do ^{a great} ~~great~~ job at ensuring the organic Standard maintains is level of integrity.
- NOP has emerged as strict regulator and enforcement arm
- **but it will never fill the role of educator, marketer or promotor."**

There is no need for Australia to retain the limitations of NOP and OMRI.

Australian Certification Authorities could adopt a long term vision and begin initiatives to increase productivity of Australian organic-certified agriculture, as well as to:-

- solve the problems faced at the farm gate.
- begin technical research in labs and paddocks on fertilisers and soil amendments.
- educate consumers as to the meaning and benefits of 'organic'.
- implement new systems which simultaneously employ both feedback and feedforward not only for administrative tasks in compliance management but also for scientific issues and for proper use of all the 11 essential plant nutrients in organic-certified crop production.

Decisions for the Senate Standing Committee on Economics dealing with third party certification of foods include:

- how strongly they feel about the evident weakness of technical management of 'organics' at the moment and therefore
- to what extent and how strongly the Committee should endorse the views expressed in the last paragraph.

Diagram 1: Decision Tree For Use of Chelated or Unchelated Micronutrients

