

SUPPLEMENTING
LIVESTOCK
with
NUTRIDOSE

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A PRACTICAL GUIDE TO
NUTRIDOSE
SOLAR INJECTORS

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Advances in Water Medication

Water Medication is now established as a safe and reliable method of supplementing livestock. Advances in the application of this method has seen increases in production in both wet and dry seasons. The benefits of this method of supplementing cattle has been clearly demonstrated in controlled trials, one trial in the Northern Territory showing a net benefit of \$213 per breeder cow year (Hill, Keith 2003, "Effectiveness of water medication to supplement breeder cattle in Spinifex country", NT dept of Business, Industry & Resource Development).

The cost saving of this method of supplementation over other methods is also clear, water medication lowering the cost of supplementation by up to 75%.

The problems encountered so far with water medication systems have fallen into the following areas:-

- Inaccurate meter
- Failure of the solenoid valve
- Variation in line pressure
- Over delivery by the pump
- Siphoning
- Urea layering in the concentrate tank
- Human error in mixing

The safety of urea supplementation systems has always been an issue and development work has been aimed at making the system 100% safe. This has been a progressive development and the latest systems using the Nutridose Concentration Monitor are now control all of the above situations.

Nutridose Now Microprocessor Controlled

New developments in water medication equipment continue to improve the safety of this very cost effective system of delivering urea and other elements to grazing cattle.

The new Nutridose Monitored system is now microprocessor controlled and can be programmed to suit the individual situation. The unit has the capability to dose according to timed injection or to deliver a measured dose. A unit that uses a time only injection is calibrated manually. The unit that uses the measured dose only is set to deliver a predetermined dose. The unit that uses a combination of time and measured dose is set to deliver on a primary timed dose and this is checked against a flow meter that measures the dose delivered.

The selection of the type of unit required depends on water quality and the type of system required. Where the water is highly depositive or has a high iron content a timed unit is recommended. This may be combined with a flow sensor to detect injection rates, however the primary control will be time of injection. Depositive water will cause higher maintenance requirements as the deposits on the flow meter vanes will need to be regularly cleaned.

Nutridose Now with UHF Telemetry

The new Nutridose Monitor is designed to be compatible with radio telemetry systems and these can now be used in a number of ways.

The basic telemetry system uses a GME Electrophone system that has select call facility and advises the base station when the system has shut down. This system can be integrated with most existing farm systems and can be installed for the cost of a radio.

More advanced telemetry will constantly advise the base on the total system integrity, including water flow, trough level, trough overflow, concentrate tank level and alarm modes, as well as being able to remotely switch pumps or the unit on and off. These systems log the data against time and give a complete record of the system operation from a base station. It is now possible to monitor the medication system from your car, with screen showing the system parameters in real time.

The time and labour saving with the judicious use of telemetry can be enormous, as the normal monitoring function of physically checking remote watering systems can be done from base in a few seconds and the site visits can be conducted as required.

The Nutridose Concentration Monitor

A Major breakthrough in Water medication.

The Nutridose Concentration Monitor provides additional safety when feeding urea to cattle via the drinking water. While it is not possible to measure the concentration of urea itself, the concentration monitor measures the increase in conductivity of the water when the ingredients (ammonium sulphate, monoammonium phosphate, salt or urea phosphate) that are mixed with the urea are added. This is directly related to the urea concentration by association.

The conductivity of water from different locations will vary significantly, however, it will give a constant pattern for each location. When nutrients such as ammonium sulphate and phosphates are added with urea to the water, the concentration and the conductivity of the water will rise. This is measured electronically with the Nutridose Concentration Monitor. The monitor detects

any changes in concentration instantly and can be used to control the injection rate or close the injection system down. This means that if there is an increase in the concentration of urea in the water for any reason whatsoever, the Nutridose Concentration Monitor will detect this instantly and can be used to control the situation.

The monitor can be used as a process controller with the commonly used water medication equipment. It is suitable to use with the Norprim, Nutridose, Dosatron or other proportional injectors. It gives a level of process control that has been previously unachievable.

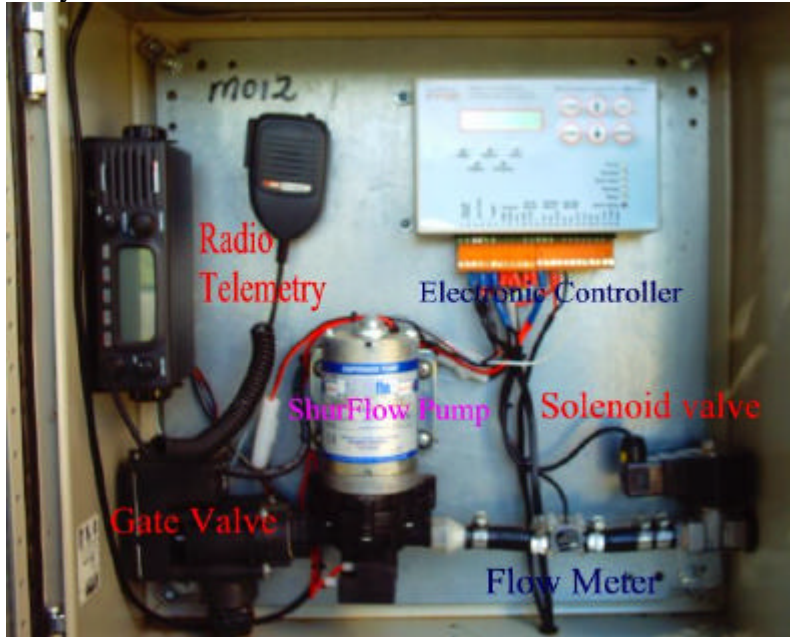
If the conductivity probe is placed down line from a mixing chamber, the meter will measure a relatively steady state that will reflect the final concentration of urea in the trough. This would be the preferable method of measuring the concentration. The Nutridose Concentration Monitor can then be used to control the injection process and provide an additional level of safety in water medication.

When the conductivity probe is placed in the trough, it will be necessary to use telemetry switching to control the injector.

If the probe is placed downstream of the injection point for the nutrient mix, the Nutridose unit will inject a set volume into the line after each 10 litres of water has been measured by an electronic water meter. This will cause a peak in the conductivity of the water that will be measured as the water flows past the probe. The height and shape of the peak will depend on the rate of water flow, the concentration of the material injected and the volume of material injected. The monitor can be set to detect rises in concentration and only allow injection when the peak levels have returned to a steady state.

The Nutridose Unit

The Nutridose System measures the dose injected, as well as the time the pump is run. This makes it the most accurate system available. High quality gate valves and solenoid valves ensure the system is secure when shut down.

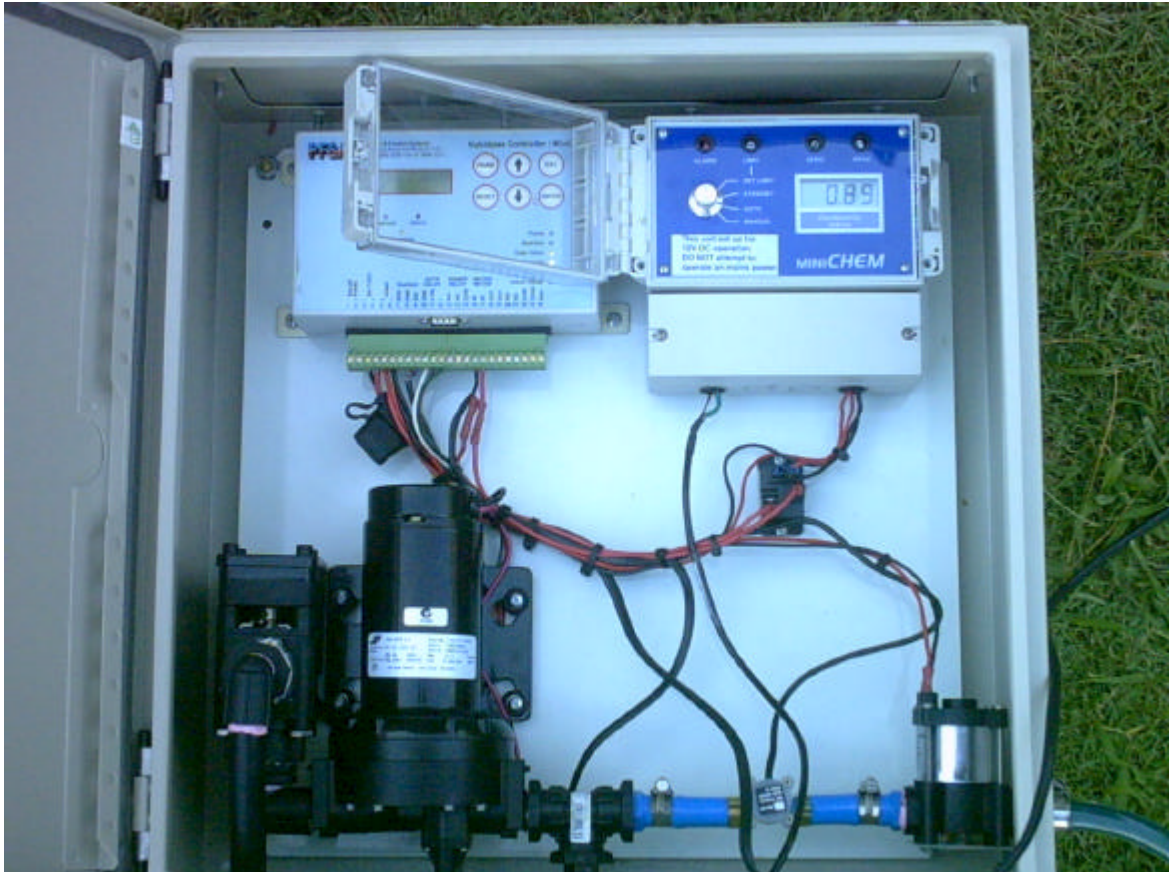


A high quality water meter ensures accurate and reliable measurement of water flows without any restriction in supply. The size of the concentrate tank can vary, the installation below uses a 10000 litre tank and services 2500 head of cattle.



Nutridose Concentration Monitor

The Concentration Monitor can be mounted in the same case as the Nutridose Controller unit. The miniChem unit is seen here measuring the concentration level.



In this configuration the monitor can be set to act as a process controller by isolating the water meter signal that activates the Nutridose or the Norprim pump. If the concentration is above a preset limit, a relay, inserted into the wiring from the water meter, isolates the line and no signal to inject is received by the Nutridose unit.

The concentration monitor would detect a rise in concentration due to double dosing by the unit, mistakes in mixing the concentrate, siphoning or layering of the concentrate in the concentrate tank and would not allow the unit to inject until the concentration had fallen below the set point. This has the effect of causing the Nutridose unit to miss an injection and effectively halve the concentration delivered. This allows the Nutridose unit to continue to medicate the water without shutting down.

An alternate control system is to use the concentration monitor to control solenoid valves that are used to switch the source of supply to the injector pump from the concentrate tank to a plain water supply. When the concentration is above the preset limit the solenoid to the plain water supply will open and only plain water will be injected. When the concentration is below the limit the solenoid on the concentrate tank will open and the concentrate will inject. This method is more effective than controlling the water meter signal, as it will control all overdose situations.

With this configuration the response time for control is very rapid as the Concentration Monitor can respond to each injection just after it occurs and immediately control any overdose.

Why Use Nutridose?

Water medication ensures all animals receive the correct dose

Traditional methods of supplementation allow some animals to over-consume, some get too little and others none at all. Water medication ensures the correct dose for all.

Animal needs in relationship to trace minerals are specific to the country that they are growing on. Their requirements at weaning, pre transport and pre slaughter and in the feedlot are also specific.

Products specifically tailored to the needs of your animals are now available for use through the **Nutridose** system.

This service is conducted in the following manner.

- a. Investigation of requirements.
- b. Water Analysis
- c. Prescription formulation solution.
- d. Measurement of progress against objectives.
- e. Formulation adjustments as required.

The investigation of requirements and formulation prescription is a consultative process between our technical staff and the client, designed to satisfy the situation needs. The prescription will be unique to the specific need and will change with the needs. This is a consultative process and specifically avoids the shotgun approach that is inherent in any proprietary preparation. Adjustments will be needed according to the pH of the water supply, as well as the dissolved salts in the water.

There are a number of Nutridose formulations available to suit different water situations and feeding requirements. Some users will require acid formulations to neutralize alkaline water and formulations are available that provide Phosphorus, Trace Elements and Vitamins.

By using the **Nutridose** and products specifically designed to provide the animals with the elements they require, maximum production can be achieved.

Installation Tips

The Nutridose electronic injector can be used in most flow configurations and is especially useful in those situations that have low pressure heads. An electronic water meter is used to measure flow and this sends a signal to an electronic controller that runs an injection pump for a set volume. The pump injects the concentrate solution from the reservoir tank into the main water line to the trough system. One unit can service single or multiple troughs.

When installing the water meter, it must have clear flow for ten diameters on the intake side and for five diameters on the outflow side to ensure non turbulent flow and accuracy in metering. For example, if you are using a 2 inch meter in a three inch line, then it is important that there is 500 mm of 2 inch inlet before the meter and 250 mm on the outlet side. For very low flow and pressure situations, it may be necessary to use a one inch metering system. This system will still provide a flow maximum of 10000 litres per hour and will be sufficient for most installations.

The size and type of trough will also influence the size of system required. For example, if large round troughs are used, they have enough reservoir capacity to water 300 head and will fill on a slow recovery basis. Under these conditions, a smaller system will be sufficient. If small capacity troughs are used, then it is important to have the larger line to ensure rapid filling.

When joining the poly fittings it is much easier if you use a hair drier to heat and expand the poly pipe before fitting or removing the pipe.

All exposed electrical wires may have to be shielded with garden hose if Cockatoos, Dingos or the like take to chewing on them.

If you are considering a mobile or movable installation, such as for cell grazing, it is convenient to leave the main water meter installed in the line on a permanent basis at the different installation points and move the injector pump around as required. Some people have mounted a mobile unit on a trailer, complete with reservoir tank, and simply connect it to the meter at the alternate watering points.

Trough valves should be “all or nothing”. Valves that dribble will not activate the water meter.

If the water pressure is too high, mount the injection saddle on the suction side of the pump.

Non Return Valves & Water Hammer

Water hammer is a pressure shock wave induced in plumbing supply systems whenever there is a sudden change in the steady state condition of a non-compressible liquid such as water. Pumps, valves, and fast solenoid-activated valves are all examples of devices that can induce water hammer within a typical plumbing system. You can check for the presence of hammer by watching the meter at the time of injection. If the meter runs backward at or soon after injection there is significant hammer and it must be corrected.

Newton's law states that for "every action there is an equal and opposite reaction." If water is flowing into a trough then is suddenly shut off, the kinetic energy of the flowing water reverses direction and must be dissipated during the transition to a steady state. This energy is initially reflected back through the plumbing system in a direction opposite to the original flow, creating an oscillating shock wave. Depending on the extent of the shock wave, a loud banging or rattling sound can be heard as pipes expand and move as the shock wave dissipates.

Traditionally, the solution to water hammer has been to install pipe risers. Sometimes these risers would be as high as 24" or more, depending on the pipe diameter. In theory, the risers would trap air as the plumbing system is first activated. The column of air acts as a natural damper, compressing as it absorbs residual shock waves from a sudden change in the supply flow.

Non return valves are a vital consideration in all installations. The non return valve prevents back flow of the injected medication and is installed between the outlet side of the water meter and the injector. This ensures that when the medication is injected under pressure that it does not flow backwards to the meter and cause the meter to run backwards.

Any reverse flow through the water meter will seriously affect the accuracy of medication and may lead to potentially serious overdose situations in some circumstances. This is particularly important in systems smaller than 40 mm. **To avoid reverse flow through the meter, place the injection point on the upstream side of the main water meter.** The non return valve will also ensure that this does not occur and is an important safety feature of the system. Combined with the installation of an air riser, water hammer problems will be eliminated.

Anti Siphon Installation

In cases where the unit is installed in a high position and supplies troughs more than 6 metres lower than the installation, it is necessary to install an anti siphon device. Anti siphons are also installed as a fail safe in most systems.

For the electronic Nutridose system, a solenoid valve that is normally closed is installed in the delivery line. This prevents backflow and siphon when the system is not injecting.

For Dosatron units, the installation of the anti siphon will require the attachment of the anti siphon valve to a separate water source, so that when siphon pressure is such that the valve is opened, water, not air, will be sucked into the line, thus relieving the siphon pressure on the unit.

A practical set up to prevent air being siphoned into the system is to install a 200 litre drum as a reservoir for the anti siphon. This is connected directly into the anti siphon valve or into a valve installed in the down side line. A water supply and float valve is connected to the reservoir to ensure a constant water supply is available.

Under working conditions, this valve will activate only when the siphon pressure exceeds the valve setting, normally when the system is running at full demand flow and all cattle are drinking at once. For 1500 head of cattle drawing off the one system, this may occur for about one hour per day and the anti siphon valve may pull about 100 litres of water into the system.

Do not connect anti siphon valves directly to the air, as this will drag air into the line and may lock the system under certain circumstances.

Under conditions of strong siphon pressure, for example, when the lowest trough is more than 25 meters below the unit, the anti siphon installation should be based on a 50 mm pressure relief valve connected in the same manner as described above.

Urea Feeding

At the beginning of a drought or in any normal season after the first frosts, the pasture grasses have lost their protein and while they have sufficient energy to sustain cattle the lack of protein will cause the animals to lose weight. Urea feeding in the wetter periods of the year has also been shown to increase productivity. The earliest practical indication of the reduction in protein is seen in the faeces of the cattle. The faecal pat begins to mound, dries out quickly to a hard fully formed pat and these become readily visible over the paddock. Once this begins to occur, start feeding urea.

This may begin to occur when the pasture is still green and it appears that the protein may still be sufficient, when in fact, production losses are beginning to occur. A number of graziers are now feeding low quantities of urea during the wet season as well as the dry season. Pasture sampling and faeces analysis can give a more accurate picture of pasture protein.

Urea is a source of nitrogen for certain bacteria in the animal's paunch (rumen) and allows them to grow and digest the cellulose contained in the dry grasses more efficiently. These bacteria themselves are then digested by the animal and form a source of protein for its maintenance. Because of this simple relationship the feeding of small amounts of urea will allow improved utilisation of dry pasture, increased intake and will maintain body weight of cattle as long as the energy in the pasture holds out. Once the dry pasture is used then both protein and energy must be supplied to the animals. Nitrogen should be fed at any time that protein levels fall, take note of the faecal pat, as this will be the first indication that the protein is beginning to fall and occurs in normal years as well as in drought. It is also important to feed Sulphur with the urea, as the bacteria require sulphur to fix the nitrogen and convert it into protein.

Nitrogen status of the animal can be assessed through blood testing as well as faecal analysis. Blood testing is simple and can provide valuable information on the nitrogen status.

Feed a mix of a soluble ammonium sulphate and urea, that provides both nitrogen and sulphur to the rumen bacteria. Use a technical grade of Ammonium Sulphate.

Feeding urea and ammonium sulphate through the water is economical. While it may cost as much as 10 cents per head per day using other methods, water medication costs only about 0.85 cents per head per day to do a better job as all cattle receive a dose according to their body weight and there is no risk of any missing out or individuals overdosing.

Economics of Urea Feeding

The economics of dry season urea feeding have been well established by trials conducted by various Agriculture Departments throughout Australia and relate to the reduction in dry season weight losses. For example, work in Queensland at Swans Lagoon in Townsville has shown that weight losses of 0.5 kg per day could be prevented by the feeding of 30 grams of urea per day, provided that energy supply was not limiting. This related to 40 to 50 kg per head over the dry season and the saving of this loss also allowed earlier turnoff, thus increasing overall resource utilisation and increasing farm productivity.

The cost of feeding urea depends on the system used. The most expensive system is through blocks. At a current price of \$850 per tonne, it costs approximately 8.5 cents per head per day to deliver 33 grams of urea. The equivalent amount of urea can be delivered through the water for approximately 0.85 cents per head per day, at current prices. For a 100 day feeding period, this represents a cost of production of \$8.50 or 17 cents per kg (over 50 kg advantage) for block feeding or 85 cents (1.7 cents per kg) for water medication.

For a 1000 head herd, the saving gained by using water medication instead of blocks is approximately \$2295 per month. This means that the full capital cost of the water medication equipment will be recovered every 45 days.

The flow on savings in freight (one third less weight) and labour will further add to the savings.

Feeding urea at times other than in the dry season is a relatively new area and considerable production advantages have been shown. Some of these are discussed later in this brochure, however, the early recognition of protein drop allows urea feeding to start early and production losses are prevented. The convenience and economics of the system also promotes its early use.

How to feed Urea

Getting Started:

To calculate the unit settings required and to establish the amount of urea to dissolve in the reservoir tank, it is best to adopt a standard system. The system is simple, easy to use and will ensure that you have full understanding and control of your feeding system.

1. Decide the amount of urea per head per day required.

This will depend on the state of the pasture and the type of animals; however, a guide is that a 400 kg animal will require at about 40 to 60 grams of urea a day to maintain weight on dry pasture. If the pasture is still slightly green, or earlier in the season, then the amount of urea is reduced and 12 grams of urea per day may be sufficient.

Experience will tell you if the amount is correct, particularly if you have weigh scales and can follow the growth rate of the animals.

2. Determine the drinking rate of the cattle.

When feeding urea it is vital that an accurate water meter is installed. By using this meter it can be accurately determined what the cattle are drinking. This will vary from day to day, so monitor this over a period of a few days.

Say the cattle are drinking 30 litres per day, on average. Calculate the amount of urea required in the drinking water. That is, divide the urea required per day by the amount of water drunk per head per day.

$60 \text{ g urea} \div 30 \text{ litres water drunk} = 2 \text{ g/l required in the drinking water.}$

3. Select the dilution rate setting on the unit.

The size of the reservoir tank used and the number of cattle being fed primarily determine this selection. For this example we choose a dilution rate of 1%, that is 1:100.

4. Determine the amount of urea to be added to the reservoir tank.

If we require 2 grams of urea per litre of drinking water and our Nutridose is set to dilute at 1:100, then we will require 2×100 grams per litre in the reservoir tank. That is 200 grams per litre. If our tank size is 200 litres then we will add $200 \text{ g} \times 200 (=40 \text{ kg})$ of urea to the tank to give the cattle 60 grams of urea per head per day. In this case, if the Nutridose is set at 1:200

for the first week, the cattle will receive 30 g/hd/day. Use this method whenever changing or checking your calculations and apply it to any substance you wish to deliver.

5. Starting to feed Urea.

If cattle are on dry or “hayed” off pasture, the rumen contents will be slightly alkaline. This allows for rapid ammonia release from urea and relatively small quantities of urea can be toxic under these conditions. To reduce the chance of this, start feeding urea at low rates and increase the quantity gradually. For example, starting rates of 25 grams per head per day have shown to be toxic under these circumstances. This is also increased if the water is alkaline.

Ammonia release is reduced under more acid conditions and if alkaline conditions are known to exist, adding urea phosphate, ammonium sulphate or mono ammonium phosphate can increase acidity.

The provision of a readily available carbohydrate, such as Glucotrans will also ensure that the rumen bacteria can utilise the ammonia more rapidly. Add Glucotrans at the rate of 1:600 for the first five days of feeding.

The addition of plant saponins, such as *Yucca shigidera* extract, during the initial start up feeding period will reduce ammonia build up and release.

While feeding urea is generally safe, it is important to have a sound knowledge of urea feeding and metabolism before starting this practice.

6. Urea testing

Urea testing can be carried out at our laboratory. Tests cost \$10 each and results are available the same day the sample is received.

Urea and Alkaline Bores

In the rumen, the alkaline conditions, combined with the urease enzyme will rapidly break down any urea. This will happen within minutes. For cattle starting, this could be dangerous and as little as 25 grams has killed cattle under these types of conditions. When urea toxicity occurs, cattle are found dead near the trough.

Advances in understanding the use of non protein nitrogen in ruminants has led to the feeding acid forms of urea that is safer. Urea feeding has always had risks associated with it. Urea breaks down in the gastrointestinal tract under the influence of the enzyme, urease to ammonia (NH₃). This is what is toxic and this occurs more rapidly in an alkaline environment. Urea will also break down to ammonia in the alkaline water and you may detect an ammonia smell in the trough. This will reduce water intake and the ammonia will be lost to the air. Studies have shown that 20% of the urea can be lost in a relatively short period.

The treatment for urea poisoning is vinegar. Acetic acid does two things, it acidifies the rumen and slows the activity of urease and it forms ammonium acetate by combining with the ammonia. The ammonium ion is non toxic.

Urea can be stabilised to a certain extent with acid and this will slow the rate of release. The best compound to use here is urea phosphate. Citric acid has also been used. One problem is to use enough acid to stabilise the pH.

The high pH of bore water and the high bicarbonate load is going to make it difficult to economically add enough acid to completely stabilise the urea. This means that in most bore waters, urea is always going to break down more quickly than in an acid system. Under these conditions, some urea will break down to ammonia and this will give an ammonia smell to the water. This may affect water intake.

Urea phosphate is a highly soluble source of Nitrogen (18%) and Phosphorous (19%) that is free from any contaminants. The urea is bound to the P and is more stable than urea alone. The pH of this material is very low (pH 2) and suitable for use in bore water.

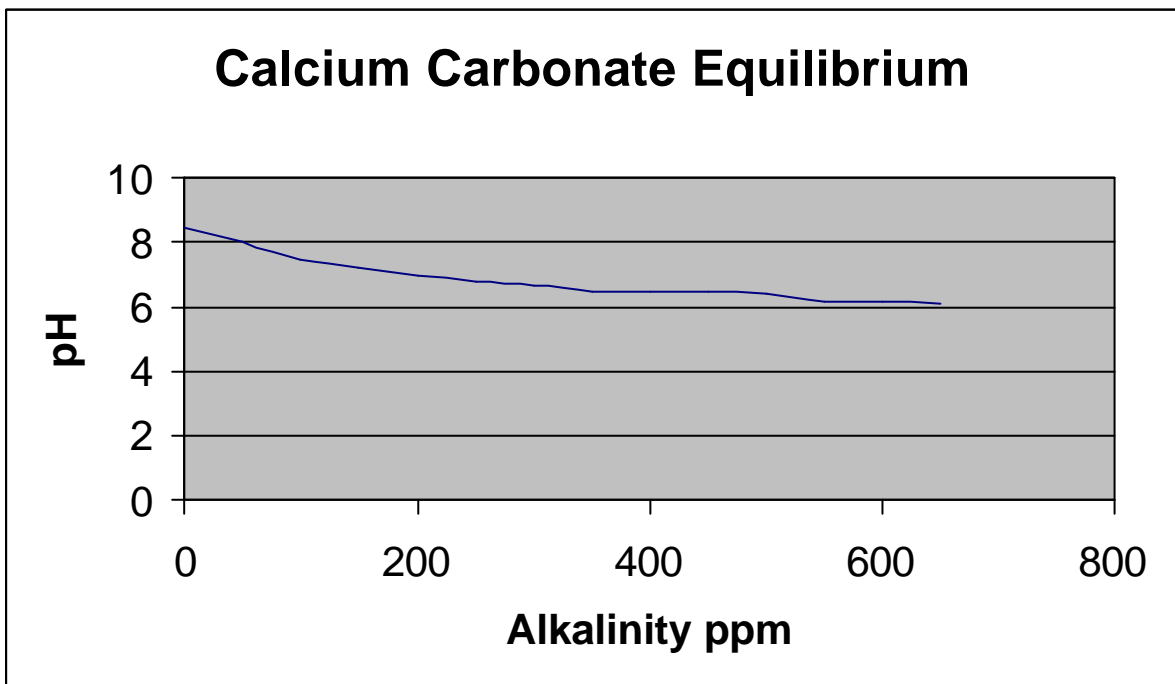
There are a number of Nutridose formulations that are based on urea phosphate that are suitable for using with alkaline bore water.

Understanding pH

While pH, the measurement of the acidity or alkalinity of water, can be a useful measurement in water management, it must be used in conjunction with a full water analysis and an understanding of the buffering capacity of the water.

Water contains many dissolved ions, depending on its source. “Alkalinity” is a measure of the concentration of carbonate, bicarbonate and hydroxide and contributes to the total hardness. Alkalinity refers to the capability of water to neutralize acid. This is really an expression of buffering capacity. A buffer is a solution to which an acid can be added without changing the concentration of available H⁺ ions (without changing the pH) appreciably. It essentially absorbs the excess H⁺ ions and protects the water body from fluctuations in pH

This means that when acid is added to water with a high alkalinity, the pH might not change. In some cases the pH may even rise as the resultant salts may more basic than the acid added. The result is that pH, on its own, is not a very useful measurement and must always be considered in conjunction with the alkalinity of water.



The graph above may be used to compare the pH of a water to its total alkalinity and determine if the water is either corrosive or depositive. If there is sufficient alkalinity in water and the pH is high enough (above the line) then calcium carbonate or lime will precipitate out of the water and form a coating on the lines of a water distribution system. This coating is desirable up to a point, as it will help protect a metallic water line from corrosion. However, excess deposition of calcium carbonate can eventually clog a water line.

Water with a pH and alkalinity that fall in the corrosive zone in the graph (below the line) above are likely to cause corrosion of metal lines. This corrosion allows iron to dissolve into the water and may cause “red water” and red staining of fixtures. These stains may cause the water to be less aesthetically palatable but are not usually a danger to health.

Water with high alkalinity will cause urea to breakdown to ammonia. This can be easily smelt in the water trough or the holding tank. The ammonia will be lost to the atmosphere and a strong ammonia smell will also reduce the water intake of the cattle. Acid stabilisation of water with high alkalinity will reduce or prevent the loss of ammonia.

While any acid can be used, the selection of a suitable acid should be based on the following criteria:-

- a. Corrosiveness (avoid highly corrosive materials like hydrochloric acid or sulphuric acid)
- b. Cost
- c. Ability to contribute to the nutrition of the animal
- d. Ease of use

While citric acid is a non corrosive acid, it will contribute nothing to the nutrition of the animal. Technical grade MAP will acidify the water and help prevent ammonia loss, however it is difficult to dissolve. Urea Phosphate is a strong acid, contributes both nitrogen and phosphorus to the nutrition of the animal, is easy to dissolve and safe to use and is cost effective.

Calculating the amount of acid required

As each water system is unique and the measurement of pH alone will not give sufficient information for the user to calculate the amount of acid required to stabilise the urea. A system of trial and error is the most practical means of determining the amount of acid to use.

While the presence of an ammonia smell in the concentrate tank or the trough will indicate that acid stabilisation is necessary, all systems will benefit from acid stabilisation and the provision of additional phosphorus will ensure that this is cost effective. In practical terms the amount of urea phosphate required to stabilise the urea will vary from 10 kg to 75 kg per 1000 litres of concentrate.

If the bicarbonate concentration of the water is above 140 ppm or the alkalinity above 200 ppm then acid stabilisation at the rate of 25 kg of urea phosphate per 1000 litres of concentrate will be necessary. For higher alkalinity, more Urea Phosphate will be required.

Urea Phosphate can be added in increasing quantities until the ammonia smell disappears.

During the process of adding additional acid, the pH may not change. This is because of the buffer effect referred to previously. Remember, pH is not a good indicator, water with a pH of 7.5 and a high alkalinity will require 3 times more acid than water with a pH of 8 and a low alkalinity.

Urea and Layering in the concentrate tank

Urea is highly soluble in water, up to a limit of 1 kg per litre. Layering of the urea can occur after a period of two to three days. This means that the concentration of urea at the bottom of the reservoir tank can be up to five times higher than at the top of the tank. This can lead to a dangerous overdose situation if it occurs. High concentrations of urea also occur at the bottom of the tank if the product is not completely mixed.

Layering probably occurs in all waters to some degree and in most cases the concentrations used are stable, however, it is important that the dynamics of each situation are understood and that appropriate measures are taken to prevent the layering occurring, or to compensate for layering. **By using the Nutridose Concentration Monitor, layering will be detectable and controlled.**

To establish the layering dynamics of your concentrate tank, samples need to be taken from different levels in the tank, top, mid and bottom. Do this after the tank has been fully recharged with the working concentration of urea and has been standing for 2 days. Test each sample with the urea test kit and the results will establish the layering characteristics for your tank. Sampling can be done with a plunge bottle or by siphon hose from the appropriate level, or simply take a sample from the top and from the drain at the bottom. If you are using the Urea Test Kit, dilute the sample by 100 times (that is 1 ml in 100 ml of the same water) before testing. Alternatively, the samples can be sent directly to us in Brisbane for testing.

Acid stabilisation with urea phosphate may help control layering, however, it may not be sufficient in all situations. Initially add urea phosphate at the rate of 25 kg per 1000 litres of concentrate, fully agitate the concentrate solution, allow to stand for 2 days and repeat the test. If there is significant improvement over the first reading but not enough to keep the concentration relatively even, 50 kg per 1000 litres may be required.

The differential draw off system is recommended for all concentrate tanks, however, a Solar stirring system may also be required. This consists of a solar powered pump that will operate during daylight to continuously agitate the system. A cost effective solar pumping system that uses advanced electronic technology to boost the solar power available is now available and is a cost effective means of preventing layering. To check the efficiency of this system, it will be necessary to repeat the analysis of top and bottom samples to ensure even concentration.

It is also important to compensate for any layering when recharging the concentrate tank. For example, if it is known that the volume left in the bottom, say 100 litres, contained 500 grams per litre, this is equivalent to 50 kg of urea. This must be considered when recharging and the amount of urea normally added reduced by this amount.

Differential Draw-off device

This simple device is recommended for fitting to all installations. It will help ensure that any layering of urea that may occur in the concentrate tank is catered for and it will help avoid potentially toxic situations arising because of urea layering.

The system uses a flexible inlet hose that is attached to a float and extends up 1 metre into the tank and has a 10 mm inlet. At the same time, there is a second 1 mm inlet at the bottom of the tank. The draw ratio for these is 10:1. That is, if the bottom concentration were 500 g/l and the upper concentration 50 g/l, the mix would be 100 g/l. You can do the sums for any ratios that might occur, but the end result is that any layering of significance will be catered for and the concentrated layer diluted out by a process of differential uptake. By using different inlet hole sizes, the ratio can be changed. For example a 10 mm, 2 mm ratio draws approximately 7:1, however, the ten to one ratio would suit most situations.

As the water level and the float drops the 10 mm hose will drop until the tank requires refilling.

The 1 mm hole is only fine and this is protected by a filter. As the filters will require regular cleaning, an “over the top” installation may be better for ease of removal and cleaning.

This technique, on its own, may be enough to control layering, however, in severe situations, a combination with tank stirring would control layering.

Controller Flow Sensor Maintenance

In cases where the water is from a bore that is high in pH and high in minerals and the water is highly depositive the controller flow meter will require regular maintenance. Fine mineral deposits will accumulate on the magnetic vanes of the meter over time. In some cases this occurs after about 12 months, however, it may be sooner.

This will generally cause the meter to spin at a lower rate and it will underestimate the amount injected per pulse. The controller will recognise this as a “pump on too long” fault and shut down.

The functioning of the flow meter can be checked manually by watching the injection rate on the main controller screen. If the rate is erratic or slower than normal, flow meter maintenance will be required.

For those operators with highly depositive bore water, it is recommended that the controller be reprogrammed to operate on a timed injection as the primary control, with the flow meter giving a secondary reading of the amount injected. This will allow accurate calibration of the injection, especially in high pressure situations, and will also ensure consistency of injection if the flow meter becomes contaminated or fails.

The change to this method of injection requires a software update that must be done at the factory.

It is also recommended that regular maintenance be carried out on the flow meter where the bore water is depositive. In some cases the flow meter will need to be replaced on a regular basis, for example, each twelve months. In others, a six month maintenance program that uses acid to flush the flow sensor and remove the scale may be sufficient.

Main Water Meter Maintenance

The water meter in the main supply line does not require any specific maintenance, however, if the water is contaminated with mud and silt or foreign material and a filter is not fitted, the meter may clog.

It is important, however, to observe the flow and behaviour of the register on a regular basis. Take the time to watch the water flow and the operation of the magnetic switch. The flow should be smooth and the switch should operate normally. If the flow is observed to be jerky or erratic, it indicates that the operation of the register gears is faulty and the register may need to be serviced or replaced.

In severe cases the flow may be extremely jerky, in this case replace the register.

Liquid Nitrogen versus Urea

It is important that you gather all of the appropriate information before making a decision to use a so called “safe” form of urea marketed as mixtures of urea and molasses or dunder. One form is marketed as Cattle King. Other forms are based on methylene urea and marketed as a slow release fertilizer. These are manufactured with formaldehyde, which is a banned product for feeding to cattle.

A recent analysis of the Cattle King product showed that it contained 440 grams per litre of degradable urea. This means that of the 26% nitrogen the product was claimed to contain, 20.24% was straight urea. The rest would be from non urea sources.

At a dose rate of 20 mls per head for cattle this would provide 8.8 grams of urea and would most certainly be safe. If you wanted to provide 40 grams of urea, then you would need to dose at the rate of 90 mls per day. This would cost approximately 11 cents per head, compared to urea alone at approximately 1.7 cents per head.

Note that the Cattle King product contains significant amounts of urea and it will be toxic in an overdose situation, exactly the same as urea will. There is at least one grazier that can attest to this.

It makes no sense to buy this product and feed it at a rate of 20 mls per head per day.

The toxic part of urea is the ammonia. Safe forms are the ammonium ion. Urea toxicity (read ammonia toxicity) is treated with vinegar (acetic acid) and this produces the non toxic ammonium acetate. Similarly, ammonium sulphate and mono ammonium phosphate provides a non toxic source of nitrogen. Products such as urea phosphate are also low toxicity as the urea is strongly bound to the phosphate and is slow to release.

Urea is the most economical form of nitrogen that cattle can use and it can be fed safely, with care. Acid stabilisation of urea with urea phosphate slows its release and reduces ammonia build up, however, urea must be treated with respect at all times.

It is a simple matter to make a liquid nitrogen concentrate of your own. Use the PFSA Formula Number 3 or 4 at the rate of 500 grams per litre of water. Use a Nutridose controller fitted with a low volume pump to deliver 20 to 30 mls per injection to give a trough concentration of 1 gram of PFSA 3 per litre of water. If desired molasses can be added to this concentrate at the rate of 10%. That is, replace 10% of the water volume with molasses.

This will give a very economical method of delivering non protein nitrogen.

PFSA Formula 1

PFS NO 1 SPECIAL

Based on a mixture of Urea, Technical grade Ammonium Sulphate and Technical grade Monoammonium Phosphate, this blended product supplies Non Protein Nitrogen, Phosphorus and Sulphur to ruminants through the drinking water.

Acidic Formula: Specifically designed to help prevent ammonia release from treated water caused by alkaline water source (water should be tested to determine the degree of alkalinity)

Analysis	
Analysis	Percent W/W
Minimum Crude protein	204.1
Urea Equivalent	71.0
Nitrogen (N) Total	32.7
Phosphorus (P) as water soluble	8.0
Sulphur (S) as water soluble	2.9
Biuret maximum	0.4

When fed at the rate of 40 grams per head per day, this product will supply 3 grams of Phosphorus and 29 grams of urea per head, at a cost of approximately 3.2 cents. This is a very economical method of supplying Urea and Phosphorus.

WARNING: This preparation contains urea, which may be poisonous if taken in extreme quantities or too quickly. DO NOT FEED THIS PRODUCT STRAIGHT. USE ONLY AS DIRECTED.

SAFETY DIRECTIONS: CORROSIVE Keep out of the reach of children May irritate the eyes, nose, throat and skin. Avoid contact with the eyes, skin and clothing. Do not inhale dust. When preparing the concentrate, wear elbow length PVC gloves and face shield. Do not inhale vapour or mist from concentrate. If clothing becomes contaminated with concentrate remove clothing immediately. If product or concentrate contaminates the skin, immediately wash the area with water and soap. Immediately after use wash hands, face and arms as well as any areas of the body that are exposed. In case of contact with the eyes, wash immediately with plenty of clean water and seek medical advice. If swallowed, give plenty of water and contact a doctor or the poisons centre on 131126. Do not induce vomiting. After each days use, wash gloves, face shield and contaminated clothing.

PFSA Formula 2

PFS NO 2 SPECIAL

For use as an additive to livestock drinking water. Use in alkaline water.

Supplies Non Protein Nitrogen, Phosphorus and Sulphur to ruminants through the drinking water. Acidic Formula: Specifically designed to help prevent ammonia release from treated water caused by alkaline water source (water should be tested to determine the degree of alkalinity).

This formula has added Urea Phosphate and is designed to be used where there is additional bicarbonate in the water.

Analysis	
Analysis	Percent W/W
Minimum Crude protein	204.1
Urea Equivalent	71.0
Nitrogen (N) Total	32.7
Phosphorus (P) as water soluble	8.0
Sulphur (S) as water soluble	2.4
Biuret maximum	0.4

When fed at the rate of 40 grams per head per day, this product will supply 3 grams of Phosphorus and 29 grams of urea per head, at a cost of approximately 3.2 cents. This is a very economical method of supplying Urea and Phosphorus.

WARNING: This preparation contains urea, which may be poisonous if taken in extreme quantities or too quickly. DO NOT FEED THIS PRODUCT STRAIGHT. USE ONLY AS DIRECTED.

SAFETY DIRECTIONS: CORROSIVE. Keep out of the reach of children. May irritate the eyes, nose, throat and skin. Avoid contact with the eyes, skin and clothing. Do not inhale dust. When preparing the concentrate, wear elbow length PVC gloves and face shield. Do not inhale vapour or mist from concentrate. If clothing becomes contaminated with concentrate remove clothing immediately. If product or concentrate contaminates the skin, immediately wash the area with water and soap. Immediately after use wash hands, face and arms as well as any areas of the body that are exposed. In case of contact with the eyes, wash immediately with plenty of clean water and seek medical advice. If swallowed, give plenty of water and contact a doctor or the poisons centre on 131126. Do not induce vomiting. After each days use, wash gloves, face shield and contaminated clothing.

PFSA Formula 3

PFS NO 3 SPECIAL NT Mix

For use as an additive to livestock drinking water. Designed for the Northern Territory.

This formula is based on the product used by Keith Hill in his trials in the Northern Territory where a net benefit of \$213 per breeder cow year was shown. (Hill, Keith 2003, "Effectiveness of water medication to supplement breeder cattle in Spinifex country", NT dept of Business, Industry & Resource Development).

Acidic Formula: Specifically designed to help prevent ammonia release from treated water caused by alkaline water source (water should be tested to determine the degree of alkalinity)

Analysis	
Analysis	Percent W/W
Minimum Crude protein	202.7
Urea Equivalent	70.5
Nitrogen (N) Total	32.4
Phosphorus (P) as water soluble	6.0
Sulphur (S) as water soluble	5.4
Biuret maximum	0.4

DIRECTIONS FOR USE:

PFS No 3 Special NT Mix can be fed at the rate of 40 grams per day to supply the equivalent of 28.1 grams of urea and 2.4 grams of phosphorus. The product dilution rate is determined by the daily intake of water by cattle. For example if the cattle are drinking 40 litres per head per day, the concentration required in the drinking water is 1 gram per litre or 1 kg in 1000 litres of drinking water. Cattle should be introduced to urea preparations slowly, feeding 15 grams per head per day for the first week and then increase to the desired rate. Ensure stock have access to ample dry pasture.

WARNING: This preparation contains urea, which may be poisonous if taken in extreme quantities or too quickly. **DO NOT FEED THIS PRODUCT STRAIGHT. USE ONLY AS DIRECTED.**

SAFETY DIRECTIONS: CORROSIVE Keep out of the reach of children. May irritate the eyes, nose, throat and skin. Avoid contact with the eyes, skin and clothing. Do not inhale dust. When preparing the concentrate, wear elbow length PVC gloves and face shield. Do not inhale vapour or mist from concentrate. If clothing becomes contaminated with concentrate remove clothing immediately. If product or concentrate contaminates the skin, immediately wash the area with water and soap. Immediately after use wash hands, face and arms as well as any areas of the body that are exposed. In case of contact with the eyes, wash immediately with plenty of clean water and seek medical advice. If swallowed, give plenty of water and contact a doctor or the poisons centre on 131126. Do not induce vomiting. After each days use, wash gloves, face shield and contaminated clothing.

PFSA Formula 4

PFS NO 4 SPECIAL NT Dry Season Mix

This is a similar formula to Number 3, however has reduced Phosphorus for dry season feeding.

Acidic Formula: Specifically designed to help prevent ammonia release from treated water caused by alkaline water source (water should be tested to determine the degree of alkalinity)

Analysis	
Analysis	Percent W/W
Minimum Crude protein	246.9
Urea Equivalent	85.9
Nitrogen (N) Total	39.5
Phosphorus (P) as water soluble	2.0
Sulphur (S) as water soluble	3.7
Biuret maximum	0.4
Manganese	160 mg/kg
Copper	80 mg/kg
Cobalt	1.7 mg/kg
Zinc	80 mg/kg

DIRECTIONS FOR USE:

PFS No 4 Special NT Dry Season Mix can be fed at the rate of 40 grams per day to supply the equivalent of 34.3 grams of urea and 0.8 grams of phosphorus. The product dilution rate is determined by the daily intake of water by cattle. For example if the cattle are drinking 40 litres per head per day, the concentration required in the drinking water is 1 gram per litre or 1 kg in 1000 litres of drinking water. Cattle should be introduced to urea preparations slowly, feeding 15 grams per head per day for the first week and then increase to the desired rate. Ensure stock have access to ample dry pasture.

WARNING: This preparation contains urea, which may be poisonous if taken in extreme quantities or too quickly. **DO NOT FEED THIS PRODUCT STRAIGHT. USE ONLY AS DIRECTED.**

SAFETY DIRECTIONS: CORROSIVE Keep out of the reach of children. May irritate the eyes, nose, throat and skin. Avoid contact with the eyes, skin and clothing. Do not inhale dust. When preparing the concentrate, wear elbow length PVC gloves and face shield. Do not inhale vapour or mist from concentrate. If clothing becomes contaminated with concentrate remove clothing immediately. If product or concentrate contaminates the skin, immediately wash the area with water and soap. Immediately after use wash hands, face and arms as well as any areas of the body that are exposed. In case of contact with the eyes, wash immediately with plenty of clean water and seek medical advice. If swallowed, give plenty of water and contact a doctor or the poisons centre on 131126. Do not induce vomiting. After each days use, wash gloves, face shield and contaminated clothing.

PFSA Formula 5

PFS NO 5 SPECIAL Dry Season Mix

This formula provides urea and sulphur only. It can be used in alkaline water, however additional urea phosphate may have to be added to provide acid stabilisation of the urea.

Supplies Non Protein Nitrogen, and Sulphur to ruminants through the drinking water.

Acidic Formula: Specifically designed to help prevent ammonia release from treated water caused by alkaline water source (water should be tested to determine the degree of alkalinity)

Analysis	Percent W/W
Minimum Crude protein	271.9
Urea Equivalent	94.5
Nitrogen (N) Total	43.5
Phosphorus (P) as water soluble	0
Sulphur (S) as water soluble	2.4
Biuret maximum	0.4

DIRECTIONS FOR USE:

PFS No 5 Special Dry Season Mix can be fed at the rate of 40 grams per day to supply the equivalent of 37.8 grams of urea. The product dilution rate is determined by the daily intake of water by cattle. For example if the cattle are drinking 40 litres per head per day, the concentration required in the drinking water is 1 gram per litre or 1 kg in 1000 litres of drinking water. Cattle should be introduced to urea preparations slowly, feeding 15 grams per head per day for the first week and then increase to the desired rate. Ensure stock have access to ample dry pasture.

WARNING: This preparation contains urea, which may be poisonous if taken in extreme quantities or too quickly. DO NOT FEED THIS PRODUCT STRAIGHT. USE ONLY AS DIRECTED.

SAFETY DIRECTIONS: Keep out of the reach of children. May irritate the eyes, nose, throat and skin. Avoid contact with the eyes, skin and clothing. Do not inhale dust. When preparing the concentrate, wear elbow length PVC gloves and face shield. Do not inhale vapour or mist from concentrate. If clothing becomes contaminated with concentrate remove clothing immediately. If product or concentrate contaminates the skin, immediately wash the area with water and soap. Immediately after use wash hands, face and arms as well as any areas of the body that are exposed. In case of contact with the eyes, wash immediately with plenty of clean water and seek medical advice. If swallowed, give plenty of water and contact a doctor or the poisons centre on 131126. Do not induce vomiting. After each days use, wash gloves, face shield and contaminated clothing.

Urea Feeding for Production

Urea and HGP's

Urea can be fed all year round to increase production. There is also an interaction between the use of HGP's and protein content of the pasture and increased responses to HGP's can be gained from urea supplementation.

An example of this was seen when comparing two groups of cattle on a silk sorghum crop. Both had been treated with 60 mg of trenbolone (Revalor). One group received 25 grams of urea per head per day through the drinking water and gained at the rate of 0.7 kg per day. The other received 40 grams of urea per head per day through the drinking water and gained at the rate of 1 kg per head per day. The group receiving 25 grams of urea also had a more fibrous faecal pat than the group receiving 40 grams.

This represents a large production response and allows maximum utilisation of the pasture of crop resource.

Protein can begin to drop when the pasture is still green and while it appears that the protein may still be sufficient, in fact, production losses are beginning to occur. A number of graziers are now feeding low quantities of urea during the wet season as well as the dry season. By using the Nutridose system, it is possible to administer urea all year round. This is more difficult using other systems, as cattle will generally not take licks during the wet season.

As well as protein, the fibre content of the pasture is also important. As the fibre content rises, the ability of the animal to eat sufficient quantity decreases. Urea increases fibre digestibility and increases dry matter intake. This is also important at the early stage, as it is dry matter intake that has a direct bearing on growth rate.

All of these factors point to the value of urea feeding at various stages throughout the year, not just drought or dry season.

A more subtle aspect of feeding urea all year is the contribution of the additional nitrogen as a source of nutrition for pasture plants. Although this has not been measured, fertilisation of pasture will give growth responses.

Phosphorous Feeding

How Much to feed

Phosphorous is the most expensive element to feed to cattle so it is important not to waste it. The correct amount to feed is determined by the gap between what is available from the pasture and water and what is required by the animal.

Much of Australia is phosphorous deficient. This leads to a number of problems, particularly lowered fertility and weaning weights, but also bone chewing and botulism. Trials have shown an increase in fertility of up to 20% when adequate phosphorous is supplied to deficient cattle. It has also been shown that nitrogen should be fed with phosphorous.

It is possible to measure the gap by doing faecal analysis of nitrogen and phosphorous. The amount of P needed will vary on a seasonal basis and it is also important to remember that nitrogen is required to utilise the P that is available.

To determine the P status of your herd, select dung samples from the young pregnant or wet cows. Take samples from different parts of the property to build up a profile of the property. Testing kits are available by contacting Agrifood in Toowoomba (phone 0746330599 fax 0746330711). They will send you a sample collection kit with all instructions and conduct the analysis.

If the faecal nitrogen is less than 1.3% of the Dry Matter of faeces, a primary protein deficiency is indicated and supplementation should start immediately. The following table is used to estimate Phosphorous levels. At low nitrogen levels, the phosphorous status cannot be measured with any certainty.

Faecal N Level (%DM)	Faecal P level (%DM)	P Status
1.35 – 1.5	<0.15	Acute deficiency
	0.15 – 0.20	Deficient
	0.20 – 0.25	Marginal
	>0.25	Adequate
1.5 – 2.0	<0.20	Acute deficiency
	0.20 – 0.25	Deficient
	0.25 – 0.30	Marginal
	>0.30	Adequate
2.0 – 2.5	<0.25	Acute deficiency
	0.25 – 0.30	Deficient
	0.30 – 0.35	Marginal
	>0.35	Adequate

2.5 - .30	<0.30	Acute deficiency
	0.30 – 0.35	Deficient
	0.35 – 0.40	Marginal
	>0.40	Adequate

Urea Phosphate

Urea phosphate is a highly soluble source of Nitrogen (18%) and Phosphorous (19%) that is free from any contaminants. The urea is bound to the P and is more stable than urea alone. The pH of this material is very low (pH 2) and suitable for use in bore water.

Technical grade MAP

Technical grade MAP is a low cadmium source of soluble phosphorous and nitrogen. 12% N; 21% P.

Urea Phosphate or Technical grade MAP can be fed at a rate to provide the exact amount of phosphorous required for any given situation and will provide an economic method of supplying phosphorous as there is no waste and no excessive intake as occurs when feeding blocks or licks.

Feeding soluble minerals offer the most cost effective means of supplying Phosphorous and as many P deficient soils are deficient in trace elements, these deficiencies can also be corrected by using water soluble trace elements at the same time. Phosphorous is the most expensive element that cattle are fed in licks. By regulating the intake to their exact requirement and eliminating wastage, the problems can be solved in the most cost-effective manner.

There are also interactions between phosphorous and calcium. It is important to be aware of these and not provide phosphorous alone if extra calcium is also required. If the Calcium and phosphorous ratio is not properly balanced, then rickets will occur.

Phosphorous can be fed with urea. In fact, phosphorous needs sufficient nitrogen present to ensure its utilisation. Without sufficient nitrogen, the efficiency of phosphorous uptake is reduced. The water medication system allows you to feed the exact amounts of phosphorous and nitrogen required maximises your performance.

To calculate the amount of phosphorous and nitrogen to feed, use the same method as described for urea.

Liquid Nitrogen Dosing Equipment

Feeding Liquid Nitrogen

Liquid nitrogen (Cattle King) is generally fed at a rate of 20 ml per head per day. This low volume can now be injected directly into the drinking water by using a Nutridose unit specifically designed to deliver a low volume dose. Note that Cattle King contains 26% Nitrogen and about 48% Urea. This is as toxic as any form of Urea. At a dose rate of 20 ml, cattle will be receiving only 9.6 grams of Urea, this will not be toxic and not very effective either. Note also that cattle will be killed if this product is overdosed.

By using a peristaltic pump, the Nutridose can accurately deliver volumes from as low as 2 ml to 20 ml per injection. The Nutridose controller receives a signal from an electronic water meter each 10 litres and injects the required volume in a set time. The volume injected is adjusted by increasing or decreasing the time of injection.

Using this system, the Nutridose controller is connected directly to the liquid nitrogen container. The volume required per 10 litres of drinking water is calculated by dividing the daily volume required by the amount of drinking water consumed. For example, if the cattle are drinking 30 litres per day and 20 ml of liquid nitrogen solution is required, then 0.66 ml per litre (6.6 ml per 10 litres) will be required. The Nutridose timer is then adjusted to deliver the required dose after receiving the signal pulse from the water meter.

The injection can be made at any point in the delivery line for gravity fed systems and should be made into the suction side of the pump for high pressure systems.

A Liquid N injection unit consists of an electronic pulsed water meter, the Nutridose controller and Peristaltic pump mounted in a weather proof powder coated steel box, plumbing fittings, a 30 watt Solar Panel and a 60 amp Panasonic Gel Cell battery. The price is \$2885, plus GST. A 28 amp battery and 10 watt solar panel model is available for \$2615, plus GST.

An existing Nutridose can be converted to the Peristaltic pump system at a cost of \$885, plus GST. The controller will have to be returned to the factory for conversion.

A Conversion Kit, suitable for fitting to a Norprim injector is also available at a cost of \$890 plus GST. This kit comes complete with a 12 volt Peristaltic Pump, Silicone tubing and Mounting plate.

A basic kit, consisting of a controller, pump and water meter costs \$1985, plus GST is also available.

Trace Mineral Supplementation Through the Water

There has been an increase in knowledge of the nutritional requirements of grazing cattle throughout the world and in recent years it has been realized that trace elements may be limiting production in herds that are better managed and expectations for production are increased. It is obvious that advances in genetics and improvements in pasture have led to large increases in production. This is amply demonstrated by the reduction in age of turnoff seen in Queensland herds. Many producers now produce Jap Ox specification cattle with no permanent teeth.

This increase in productivity has been made without a lot of attention to trace minerals and recent research in the USA has shown that there is a production response to supplementing with trace minerals. Trace mineral supplementation needs are greater today because:-

- a. More is known about their essential functions and production losses resulting from marginal deficiencies have now been recognized.
- b. Genetic potential for performance has increased but trace mineral supplementation has not kept pace
- c. There are breed differences in requirements. For example, European breeds of cattle have a higher requirement for copper than British or Brahman breeds.
- d. Crop yields have increased with improved plant genetics, however, trace mineral levels have had a relative decrease.
- e. Fertilisation practices, including liming of soils has tied up trace minerals in some circumstances.
- f. Recent research in the USA has shown that trace mineral deficiencies are the root cause or the contributing factor for health problems and failures of commonly accepted disease treatments. For example, copper, zinc and selenium are essential for the proper function of the immune system. Problems such as mastitis, retained placenta, general reproductive failure, weak calves, dummy calves at birth, calf scours, abomasal ulcers in calves, pneumonia and apparent vaccine failures have all been recognized as responsive to trace mineral supplementation.
- g. There is new evidence that supplementation of trace minerals to beef cattle will give production responses.

Trace Mineral supplementation

Successful poultry and pig producers have recognized the value of trace mineral supplementation for many years. Graziers are just beginning to realize its value. To establish the level of trace mineral supplementation required, it is important to collect as much information as possible about the production and feeding system used.

- 1 The requirement of the particular class of cattle needs to be established. This includes breed type, weaners or growing cattle and growth expectations.
- 2 The nutrient content of the feed eaten.
 - a. A list of food types and the value for trace minerals they contain.
 - b. Mineral analysis of the water
 - c. An estimate of feed intake.
 - d. Interaction between minerals. For example when feeding urea and sulphur, or the level of iron is high, the requirement for copper increases. Copper and selenium requirements are higher for lactating cows.
- 3 A supplementation program, based on requirements, can be designed.

Accurate Supplementation

Because an excess of minerals can cause severe problems, it is vital that the supplementation system used will not lead to overdose in some individuals because they take too much. This is a real problem with licks and blocks. The best way of ensuring that each animal gets the exact amount is through water medication. By using the **Nutridose** system of water medication you will ensure that you are maximizing the potential of your animals.

Animals drink according to their body weight so that all classes of animals can receive basic supplementation through the on system.

Bio Availability

The type of mineral source used has an effect on the availability to the animal. For example oxides are generally poorly available, whereas sulphates are highly available. Mineral chelates are also used and are valuable sources of organic minerals, however, they are very expensive and may not give better results than the sulphate form. There have been some cases where organic sources of minerals are indicated, for example, with cattle suffering from the effects of drought or plant toxicity, or in certain feedlot situations.

Soluble Mineral Supplements

Soluble trace minerals are available for administration through the **Nutridose** system. Formulas can be designed to suit individual situations, or a standard formula can be used.

Please contact us for a formula that will suit your situation.

Transport Stress

Glucose plus Sodium and Potassium salts

Of all the management practices that animals are subject to it has been shown that transport and handling are the most potent stresses, causing more stress than castration or dehorning.

It is well known that cattle taken off feed and transported for any distance undergo a series of physiological changes that lead to muscular exhaustion, imbalance in electrolytes and metabolic changes that can take a considerable time to reverse. This is commonly seen in cattle transported to saleyards or feedlots where the transport shrink may be up to 12% and the time taken to reverse the metabolic changes and for cattle to return to normal growth patterns may be 10 days or longer. Some cattle may arrive in a completely exhausted state and may not completely recover.

From an economic viewpoint, these factors are vitally important since they can impair meat quality and increase carcass loss in cattle as well as causing production losses in cattle introduced to varying feedlot conditions. Furthermore, there is a growing concern that animal welfare conditions in the transport and handling environment are severely degraded and that this is preventable.

The changes occurring during transport are physiological and as such are largely treatable and preventable at low cost and with little effort.

The major conditions that require treatment during and following transport are Muscular exhaustion, Metabolic acidosis, Subclinical ketosis, Dehydration, Ruminal atony and Increased susceptibility to infections. These lead to reduced appetite and slow recovery.

The use of Glucose plus Sodium and Potassium salts during transport will metabolically support cattle during this time so that they arrive fresher, with less shrink, less metabolic damage and are able to rapidly adapt to their new conditions.

The results of providing this mixture in the water to cattle arriving at a feedlot have been reduced live weight shrink, less transport exhaustion, rapid return to feed and earlier adaptation to feedlot conditions. The benefits are immediately visible and the system is applied routinely to all cattle arriving at the feedlot.

It is difficult to assess if any weight or performance advantages will result from treatment of cattle with electrolytes on arrival at the feedlot, however, the benefits in improving the welfare environment are obvious and the visual response of the cattle to the treatment is such that some feedlots have installed water medication units in the induction pens and all cattle are treated off

the trucks. In this feedlot, there has been a 50% reduction in respiratory disease and the incidence of "dead bellies", due to rumen atony has been reduced from 10% to less than 1%.

Pre slaughter, there has been a reduction in incidence of "dark cutters", improved dressing percentage and increased meat quality. In one study, hot carcass weight was improved by 32 - 36 kg in cattle given access to electrolyte and glucose (Schaefer, et al., 1990). In another the improvement in carcass weight was 8 kg for animals for animals held for 24 hours prior to slaughter and 36 kg for those treated for 36 hours prior to slaughter (Jones, et al., 1992). A third study showed that animals given glucose plus electrolytes for 20 hours before slaughter had a 20 kg advantage in carcass weight to untreated animals (Gortel, et al., 1992). Work in Australia has shown a 4 kg (\$9.80 per head) advantage to treated cattle slaughtered for the local trade and 1.5% increase in dressing percentage in export cattle.

Feedlot Management

Water Administration of Micro ingredients for Feedlots

Feeding various ingredients through the water offers an accurate and consistent way of ensuring all cattle in the feedlot receive the correct dosage of ingredients. As the materials are soluble they are readily and immediately available to the animal. This is important, as dry ingredients must be solubilised before they are available to the animal. Factors such as solubility and particle size are very important with dry mixed ingredients and it is virtually impossible to ensure even mixing. Animals on dry mixes will receive different dosages of materials at different times. Many ingredients used in dry mixes are poorly soluble and may not be available to the animal under feedlot conditions where alimentary turnover times are drastically reduced.

The Nutridose offers an accurate method of administration of soluble materials to cattle through the drinking water. It ensures the dose is accurate, consistent, controllable and available. Dose regimes can be fine-tuned to very accurate levels, and adjustments can be simply and rapidly made to respond to different situations.

Using the Nutridose system, it is possible to reduce labour and capital mixing requirements for opportunity feedlots. For example, by applying all of the soluble micro ingredients through the Nutridose, it is only necessary to have basic milling and mixing equipment.

It is important to ensure that feedlot cattle receive optimum supplies of nutrients to ensure optimum performance. Micro ingredients, such as trace minerals, have always been a problem to physically mix in diets; however, using the soluble chelates it is possible to provide a source of soluble minerals and to ensure an even distribution of micro ingredients to all animals.

The Proportional Dosing Unit should be incorporated into the feedlot design. It is preferable that all pens have individual waters. Using this method a central unit can provide most of the requirements and individual, portable, units can be attached to troughs as required.

In this manner, the induction pen can have a permanent facility to provide electrolytes or anthelmintics. The hospital pen can have a unit to provide antibiotics and amino acids, or other soluble materials as required.

Vitamin A, D & E

As the drought progresses, Vitamin A reserves will deplete. If cattle or sheep have not had green feed for periods longer than 3 to 6 months, reserves will be very low and supplementation will help. Weaner cattle also respond to Vitamin E supplementation. Injectable Vitamin ADE is expensive, damages the tissues, leading to condemnations or severe trimming and requires mustering and administering the vitamins through the water avoids any tissue damage.

Administering Vitamin ADE through the water with the Nutridose system is inexpensive, simple, safe and effective. Because the cost is low, approximately 20 cents per head, repeat doses can be given as the drought progresses. Each dose will provide approximately 3 months reserves.

The water miscible Vitamin preparation is available in 25 litre drums. Each drum treats 500 head of adult cattle or approximately 1000 weaners.

Each litre contains 2000000 units Vitamin A, 5000000 units Vitamin D and 5000 mg Vitamin E.

Add 50 litres to a container and bring the volume up to 300 litres by adding water. Set the Nutridose to deliver 100 ml per 10 litres (1:100). This will provide 30000 litres of drinking water. If you wish to use a 200 litre container, add 50 litres of the vitamin solution to a 200 litre drum and bring the level up to 200 litres with water, then set the Nutridose to deliver 60 ml per 10 litres of water.

Cattle drinking 30 litres per day will receive 1000000 units Vit A, 250000 units of Vit D and 250 mg Vit E. Sheep drinking 6 litres of water will receive 200000 units Vit A, 50000 units of Vit D and 50 mg Vit E.

Feedlot Management - Induction, Starting & Hospital Pens

Catering to the Special needs of Cattle

A separate unit should be attached to the induction pen, hospital pens and the starting pens. By this method, a central unit will provide the basic ingredients to the whole feedlot water system and separate units will provide the special needs of individual groups of cattle.

In the induction pen the unit will provide the special requirements of cattle on arrival at the feedlot. By providing the correct balance of glucose and electrolytes on arrival the conditions of dehydration and subclinical ketosis that result from mustering and transport can be rapidly corrected and these cattle will have improved appetite. This technique is now in routine use on a number of large feedlots.

The special needs of cattle can also be catered for. For example, anthelmintics can be used to rapidly and effectively treat any worm burden. Increased vitamin A and E can be provided to stock from dry feed areas where these will be limiting. Increased levels of minerals such as phosphorous can be provided to cattle from deficient areas. Soluble nitrogen, cobalt copper and zinc can be provided to stimulate rumen microbes. Antibiotics can be provided to the group to treat or prevent any pneumonia. Anti bloat materials can be rapidly administered to the group if this problem appears. Non starters and hospital pens can be treated with enzymes, rumen inoculants, amino acids, soluble starches, sugars and proteins to stimulate appetite and rumen function.

The use of the water medication unit gives the feedlot operator complete control over the administration of a wide range of soluble ingredients and allows individual pens to be treated rapidly and economically.

By Pass Amino Acids

Amino acids given in the feed are generally broken down in rumen fermentation. The feeding of protected amino acids, that is, amino acids that are coated or protected from rumen fermentation, is common in feedlot nutrition. Lysine and Methionine are two amino acids that are commonly fed in a coated or protected form. Steers supplemented with 3 to 4 grams of Lysine per day had improved weight gains, feed intake and feed conversion efficiency. Lysine and methionine also have a protein sparing effect. Rumen by pass methionine has also been shown to give significant increases in wool growth in sheep and increases in milk production in dairy cattle.

Water medication also provides a means of supplying ingredients that by pass the rumen. As the majority of water that is ingested goes directly into the abomasum, by passing the rumen, this ensures amino acids are delivered directly to the small intestine in a form that is rapidly absorbed and readily available. Note that any freely available nitrogenous compounds are recycled through the blood stream and saliva to the rumen where they are used in bacterial fermentation.

The primary advantage in using water medication systems to deliver amino acids, such as methionine and lysine, to ruminants is cost saving over in feed preparations.

For weaner calves, both Lysine and Methionine will be limiting during the weaning period and as 6 grams of Lysine is equivalent to 200 grams of high quality protein meal, it provides a readily usable source of these amino acids at a lower cost than providing the meal itself.

Lysine and Methionine are available as a liquid supplement that is suitable for use through the Nutridose system and is particularly useful for dosing weaner calves, feedlot lambs and in Dairy as well as feedlot operations.

Nutridose and Silage Feeding

While silage will vary in nutritive value according to the type and source and although it can be arbitrarily assessed as to its value, it is good practice to have the silage batch being used analysed for nutritive value, sulphur levels and the level of nitrates.

With this information, it is then possible to design accurate supplementation to be used with the silage. The Nutridose can deliver a number of nutrients that will supplement silage intake in a cost effective manner.

Urea, Vitamin E, trace elements and the essential amino acids are usually fed as silage supplements in production feeding. As water by passes the rumen to the extent of greater than 80%, the amino acids Lysine and Methionine can be fed in this manner, without being destroyed in the rumen. When administered in this way they ensure that this element of the nutrition base is not limiting and they are protein sparing. Because they largely by pass the rumen it also means that more cost effective sources of these amino acids can be used.

By using water medication systems it is possible to balance energy and protein requirements in a cost effective manner and ensure that the vital essential amino acids are not limiting. If the silage contains high amounts of sulphur, it is also possible to administer Thiamine via the water and this will prevent the polioencephalomalacia that is common when high sulphur sources are fed.

Apart from ensuring nutritive goals are met, water medication is cost effective as no further mixing of the ration is required and the labour involved in ration preparation, as well as infrastructure is minimised.

Kool-Aid for Heat Stress

Conditions encountered in feedlots, holding yards and during transport, particularly on ships, have led to deaths in cattle from heat stress. As important, are the production losses that occur in the surviving animals that have various degrees of clinical and sub-clinical damage. There are also collateral issues of animal welfare that arise whenever heat stress kills or affects large numbers of livestock. The primary physiological and biochemical damage occurs in the liver due to a free radical cascade that, at worst, leads to rapid death or leaves the surviving animal with liver damage. Reductions in levels of glutathione, that indicate oxidative damage, have been shown in relatively mild forms of heat stress. This damage is repairable, however, results in severe loss of production.

Medications help in Heat Stress.

Vitamin C is a powerful free radical scavenger and can help prevent oxidative damage. Liver repair is assisted by supplying the amino acids, lysine, methionine and betaine. These compounds are delivered in the drinking water and will help prevent the free radical cascade that results in severe liver damage as well as aiding the repair of liver tissue. Other useful compounds provided in the water are sodium and glucose. Reasonable levels of sodium are normally present in most bore water, however, sodium should be added when dam water is the sole source. Water test analysis should always be conducted to show the levels of sodium.

Kool-Aid is a new product available from Pastoral & Feedlot Systems that contains high levels of Vitamin C, Lysine, Methionine, Betaine and Glucose that is designed to be used under conditions of predictable heat stress to prevent and treat liver damage. Kool-Aid is administered through the drinking water via the Nutridose system. The majority of the medications by pass the rumen and are rapidly absorbed via the small intestine where they are delivered to the liver.

Kool-Aid can be used when cattle are yarded and worked, particularly during the summer months, in feedlots, when the humidity and temperature rise to danger levels, particularly above 32°C and the humidity rises above 55%, on board ships, during periods of high risk to heat stress and in Dairy Cattle when temperatures exceed 30°C and relative humidity is greater than 50%.

Kool-Aid is a liquid formulation available in 25 litre, 200 litre and 1000 litre drums. It is administered directly into the drinking water by the Nutridose. For the treatment of severe stress where deaths have occurred set the Nutridose to deliver 200 ml per injection. For heat conditions likely to lead to severe stress use 100 ml per injection. For preventative use set the Nutridose to deliver 50 ml per injection. The cost of the formula is \$5 per litre (plus GST) and the cost per head for very severe stress with deaths is \$1 pr head, for very severe environmental conditions is 50 cents per head and for prevention is 25 cents per head. Treatment should be

continued while the environmental conditions persist or during the time cattle are exposed to severe conditions and cannot get relief.



Weaner Management

Weaners removed from their mothers and placed on a hay diet suffer from the shock of a protein and energy starvation, as well as increased susceptibility to diseases, such as coccidiosis and pneumonia. The normal practice of weaning into yards exposes the cattle to a nutritional stress that can be overcome to a certain extent through water medication.

Weaner management must concentrate on providing adequate nutrition in both protein and energy. Water medication can provide vital support during the critical time immediately after the calves have been removed from their mothers and when they can be fully fed. This period usually extends for 10 days. You must provide adequate dietary energy during this period and this can be in the form of hay or protein and energy supplements such as grain or cottonseed. The prevention of weaner stress is also vital to the future performance of the animals. Even though there are compensatory gains after periods of stress, it has been found that cattle that are severely stressed at weaning, while they may catch up to a certain extent, are never able to reach their full potential. This is particularly important when cattle are going to be finished in a feedlot. Feedlot operators are now well aware of the importance of avoiding weaner stress and are increasingly asking their suppliers to avoid weaner stress.

The weaner formula contains D-glucose, sodium and potassium salts, vitamins and minerals. These compounds are not in sufficient quantity to provide the nutritional requirements of the calf, however, they are vital to maintaining adequate hydration and assist in prevention of ketosis as well as stimulating appetite and helping prevent infectious problems such as coccidiosis and pneumonia.

For weaner calves, Lysine will be limiting during the weaning period and as 6 grams of Lysine is equivalent to 300 grams of high quality protein meal, it provides a readily usable source of these amino acids at a lower cost than providing the meal itself.

Water medication provides a means of supplying ingredients that bypass the rumen. As the majority of water that is ingested goes directly into the abomasum, by passing the rumen, this ensures amino acids are delivered directly to the small intestine in a form that is rapidly absorbed and readily available. Lysine and Betaine are available as a liquid supplement that is suitable for use through the Nutridose system and is particularly useful for dosing weaner calves, feedlot lambs and in Dairy as well as feedlot operations.

Weaner mix is included in the drinking water at the rate of 1:600 through the water medication unit. In addition, Lysine and Betaine are available as a liquid supplement and are included in the concentrate as well. The Lysine plus Betaine liquid supplement is available in 25 litre drums. This is used at the rate of 10 litres per 100 litres of concentrate and costs \$75 per drum. For weaners, 1 litre will treat approximately 100 per day. That is 3 cents per head per day. The

equivalent cottonseed meal would cost 10 cents per head per day. For severely stressed calves, double this rate.



Lignosulphonate

Functions

Although the structure of lignosulphonates is complex, their primary functions are useful. Negatively charged lignosulphonate molecules readily adsorb on positively charged surfaces as well as on uncharged particles or surfaces with less charge density. The lignosulphonate molecules either neutralize or enhance the surface charge, and therefore can function as flocculants, dispersants or binders.

Lignosulphonates can chelate metallic ions preventing them from undergoing reactions that may form insoluble metal compounds. Metallic ions chelated with lignosulphonates form soluble metal complexes for a variety of uses including increasing the concentration of minerals available to animals and preventing scale formation in aqueous systems.

The Lignosulphonate – Trace Element formulation contains a mixture of organic trace mineral complexes specifically chelated for maximum bioavailability.

Lignosulphonates also trap free ammonia and can be used to reduce ammonia loss through water systems.

These compounds are being increasingly used in agriculture to deliver minerals to plants through foliar sprays and to stabilise water systems.

Bloat Control & Dairy Cattle

The water medication unit is used to administer anti bloat detergents to cattle grazing high-risk pastures. In the dairy industry it has been used to control facial eczema, hypocalcaemia, hypomagnesaemia.

For bloat control, it is important to select anti bloat materials that do not adversely affect equipment, such as poly pipe. One popular material that is used (Comprox) can cause stress fractures in poly pipe.

High energy foods and silage, commonly required for high producing Dairy cattle, are notoriously low in minerals. The minerals they do contain are also less available. Because milk is high in minerals, the requirements of dairy cattle for a readily available source of minerals is also increased. Lactating Dairy cattle have increased requirements for the macro minerals, Calcium, Phosphorous, Sodium, Potassium, Magnesium and Sulphur. Requirements for the trace minerals are also increased and the Dairy cow has increased requirements for Iron, Iodine, Copper, Cobalt, Manganese, Zinc and Selenium. Vitamin requirements are also increased and particular attention must be paid to Vitamin A, Vitamin D, Vitamin E (in calves) and Niacin.

Using the soluble forms of minerals, as exists in the chelated form, as well as water miscible forms of vitamins, these compounds can be accurately administered through the drinking water and the levels can be fine tuned to suit the herds needs.

It is the attention to detail and the ability to fine tune the supply of these micro ingredients that makes the difference in Dairy production. The final levels of each ingredient will vary between herds and seasons, however, it is vital that the producer can rapidly react to these changing needs and that he can accurately supplement the herd with the required nutrients in a readily absorbable form.

Lignosulphonate Chelated Minerals

The normal method of supplying minerals to stock is in the inorganic form, as a salt. In the ruminant, these mineral forms are often poorly available and in some cases are tied up in complexes with other compounds and not available to the animal. The importance of supplying a source of additional minerals and vitamins to high producing animals is now very well recognised and all feedlot rations and formulated rations for Dairy cattle will have added inorganic minerals. Cattle on crop also have a requirement for additional minerals.

The minerals used in these rations are normally inorganic salts. This is primarily because they are inexpensive, however, they are also poorly available in some cases.

The mineral chelates have advantages over the inorganic salts. They are all completely soluble. They are not tied up in complex reactions with other compounds, such as phytic acid and are readily available for the animal to use. Because of their availability, they are used at lower concentrations than the inorganic salts (up to one fifth of the normal rates). Dietary phytic acid ties up calcium, zinc, copper and manganese in the ruminant. These complexes then pass directly through the gut and are lost to the animal. In the normal rumen the acid environment will cause the inorganic salts to precipitate, but the chelated minerals will remain soluble. The acid production is increased under conditions of high grain feeding and this has important implications for feedlots and dairy herds. Feeding molasses also ties up manganese and has led to deficiencies of this mineral. The provision of manganese in the chelated form will overcome this problem.

Chelates are now in common use in Europe and the USA. They are not commonly used in animals in Australia; mainly because of the higher cost and because of the particular control the feed millers have in the industry. They are commonly used in fertigation, where they have been recognised as a superior source of minerals to plants for many years.

In high producing animals, such as in feedlots, on crop or in dairy cattle, the mineral needs are increased and it is important to supply additional minerals that will be in a form readily available to the animal. Chelated minerals are ideal for this purpose.

Overseas claims for the use of chelated minerals are:-

- Increased fertility
- Increased milk production
- Improvement in Solids-not-fat content of milk
- Increased utilisation of the energy content of the ration by 1.3%
- Increased fibre digestibility by 5%

Silage Feeding

Silage is a valuable feed for cattle, however, its nutritive value can vary greatly and additional supplementation is often required to provide a complete ration. The first step is to obtain an analysis of the silage. In addition to the normal ingredients it is also advisable to ask for the levels of nitrate and sulphur.

The analysis will give the critical levels of energy and protein for the silage. For example a recent sample returned 11 MJ/kg of energy and 8.3% protein. Based on an intake of 10 kg dry matter for a 400 kg steer, this has enough energy to provide a growth rate of 1.3 kg per day, however, this would not be achieved because the protein content is too low and needs to be increased to approximately 11 to 12 percent. This means that an additional 300 grams per head per day of protein would be required.

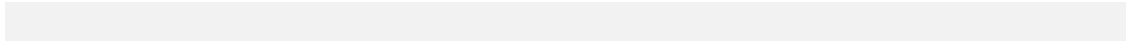
This can be provided by adding 700 grams of cottonseed meal per head per day, approximate cost of 34 cents per day plus the cost of blending in the feed. Alternatively, 60 grams of urea (equivalent to 400 grams of cottonseed meal) plus 6 grams of L Lysine and 3 Grams of Betaine (equivalent to 300 grams of cottonseed meal) can be supplemented through the water, approximate cost 11 cents per head per day.

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Crop Feeding

When cattle are placed onto high yielding and succulent crops or pastures, such as Lucerne, oats, forage sorghum or other species, such as rye grass or phalaris, they are exposed to a relative imbalance in their mineral intake. Lush crops are generally low in sulphur, sodium, calcium, zinc, magnesium, cobalt, iron, and copper and in some soils, phosphorous.

The Magnesium content of rapidly growing crops and pasture, particularly oats and grasses, can fall to dangerously low levels. Combined with high nitrogen and potassium levels this can cause "grass tetany". This is accentuated in fertilised pasture or crop. These pastures may also precipitate "milk fever", a condition due to low blood calcium and "ketosis" in high producing dairy cattle.

When feeding sorghum forages there is an increased risk of prussic acid (HCN) poisoning when sulphur is limiting and it is sound practice to have sulphur available to animals on these crops.

In winter pastures that are lush, copper and cobalt can be limiting, particularly in coastal areas and those areas where deficiencies are known to occur. Small deficiencies of these compounds will cause considerable production losses, without causing disease.

Facial eczema and photosensitivity occurs in association with lush pastures and can be controlled by the application of zinc sulphate through the Nutridose.

Many crops are often contaminated with other plants, such as pigweed, which can tie up calcium and lead to problems that will reduce the production potential.

While gross deficiencies lead to disease and even death, there is considerable loss of production when marginal deficiencies are present. In high producing cattle attention to the fine details will maximise production.

Providing mineral supplementation to high producing cattle on fast growing crops is just good common sense.

Prevention of Transit Tetany

Transit Tetany is often seen in cattle transported long distances and is caused by a drop in the calcium and magnesium levels in the bloodstream.

This condition is often made worse by allowing cattle to rapidly drink large quantities of water after periods of deprivation and in such cases cattle may rapidly die following completion of drinking.

The symptoms vary a lot; however, animals are restless, weak and may have a staggering gait. There may be partial paralysis of the hindquarters, muscle spasms, excitability and the animal may froth at the mouth and lie down. There is paralysis of the rumen and the animal does not eat. Animals may grind their teeth and may show a depraved appetite eating mouthfuls of dirt or manure.

Animals suffering from the symptoms will respond to treatment with Calcium Boro gluconate and magnesium sulphate.

To prevent the condition, use glucose and electrolytes in the water of animal's pre transport and add additional magnesium and calcium for those animals going long distances. Special mixes to prevent the build up of alkaline conditions that cause low blood calcium are available. This can be applied by a Nutridose in the yards before trucking.

Make sure animals are not transported long distances without adequate provision for food and rest. Use glucose and electrolyte in the water when animals are resting during transport.

On arrival at the destination, have medicated water available to the cattle.

Daily Electrolyte Balance

Daily Electrolyte Balance Programs

Dairy farmers can improve long term milk production by having a well managed program for dry cows.

The most critical time in a Dairy cows production cycle is in the first few days post partum. How she performs during this period sets the stage for her complete lactation performance. Cows that experience metabolic disorders at this time produce less and are more susceptible to health disorders such as ketosis, displaced abomasum and uterine prolapse.

A primary goal for this period is to control subclinical hypocalcaemia and “droopy cow syndrome”. Cows with this disorder expel foetal membranes late, have weak appetites and milk poorly. With the changes and demands of birth and lactation, two thirds of all mature cows are considered to be hypocalcaemic at calving. Recent research has established that the anionic, cationic salt balance greatly affects the body’s metabolic processes and that the establishment of an anionic salt program during the prepartum period will increase blood calcium. The research shows clearly that cows fed a negative ion diet consumed more feed post partum and had higher blood calcium levels than animals fed a positive ion diet.

These diets must be carefully designed and monitored. Do not feed salts that affect dietary ion balance unless you know the balance exactly and you monitor the effects of the salts. Incorrect feeding of salts may lead to serious health problems. Do not feed these diets to springing heifers. They have less problems than cows.

The effect of the diet can be monitored through urine pH levels. These can be measured with a pH meter or the use of pH paper and the diet can be corrected by using the correct balance of ionic salts. The following table lists the relationship between urinary pH and blood calcium levels.

Ionic balance	Urine pH	Acid –base balance	Calcium status
Positive	7.0 – 8.0	Alkalosis	Low calcium
Negative	5.5 – 6.5	Acidosis	Normal calcium
Negative	Below 5.5	Kidney overload crisis	

The best method of controlling electrolyte balance is through water medication systems. By using this method the exact levels of electrolyte can be fed and the levels adjusted as required. To use water medication, you must have controlled water. Other materials, such as bloat oil, vitamins, trace minerals, phosphorous and urea can also be delivered through a water medication system.