



Because the land is your life.

Ammonium Nitrate Fertilisers

Cal-Am[®] & N-Sure[®]

1. AMMONIUM NITRATE FERTILISERS

Incitec Pivot no longer markets **Nitram**.

Two imported ammonium nitrate compounds are sold in its place:

- **Cal-Am** - Calcium Ammonium Nitrate or CAN;
- **N-Sure** - Ammonium Sulfate Nitrate or ASN.

Nitram contained 34 % nitrogen (N), 17% N in the ammonium form and 17% as nitrate. Nitram was classified as a Dangerous Good (Class 5.1 Oxidising Agent).

Cal-Am is comprised of approximately 80% ammonium nitrate and 20% calcium carbonate. Cal-Am is available in the mainland states serviced by Incitec Pivot (excluding Western Australia). It is not available in Tasmania.

N-Sure contains approximately 40% ammonium nitrate and 60% ammonium sulfate. N-Sure is available in Victoria, South Australia and Tasmania. It is not available ex Incitec Pivots Primary Distribution Centres at Port Kembla and Newcastle, nor in Queensland.

Neither Cal-Am nor N-Sure is classified as a Dangerous Good. Both products are used in blends.

The analyses of Nitram, Cal-Am and N-Sure are compared in the following table, along with that of Cal-Gran, a blend containing 55% Cal-Am and 45% Gran-am (granulated ammonium sulfate).

Analyses of Ammonium Nitrate Fertilisers

Product	% N			% S	% Ca
	Ammonium	Nitrate	Total		
Nitram*	17	17	34		
Cal-Am	13.5	13.5	27		8
N-Sure	19	7	26	14	
Cal-Gran	16.8	7.4	23.9	10.8	4.4

Nitram[®] is a registered trademark of Orica Australia Pty Ltd.

Cal-Am[®], N-Sure[®] and Gran-am[®] are registered trademarks of Incitec Pivot Limited.

2. SECURITY SENSITIVE AMMONIUM NITRATE (SSAN)

In Australia, fertilisers containing more than 45% ammonium nitrate are classified as Security Sensitive Ammonium Nitrate (SSAN).

Anyone who is responsible for or is involved in the unsupervised transport, storage, handling or application of SSAN must be licensed. These people will require a:

- police check, and a
- politically motivated violence (PMV) check.

Organisations and individuals who transport or store SSAN will need to provide a Security Plan to the regulatory authority. It will have three main elements:

- personnel management;
- site security; and
- procedures.

Only people with a legitimate need, such as farmers, are permitted to purchase and use SSAN products. Home gardeners are not allowed to buy SSAN fertilisers.

Further details are provided in the Incitec Pivot "SSAN Storage and Transport Notes".

The only product on the Incitec Pivot Product Range that is classified as SSAN is Cal-Am.

N-Sure is not classified as SSAN.

Blends that contained Nitram or Cal-Am at concentrations above 55% (equivalent to 45% ammonium nitrate, the concentration above which the blend is classified as SSAN), have been reformulated.

Many of the new blends have the prefix **Cal-Gran** in their names, e.g. Cal-Gran Aftergraze and Cal-Gran 140, denoting that the blends contain Cal-Am (up to a maximum of 55%) with additional nitrogen as Gran-am[®].

3. AMMONIUM NITRATE IN THE SOIL

The nitrogen in ammonium nitrate is present in two forms, half as ammonium, half as nitrate.

Nitrate nitrogen is immediately available for plant uptake, once the fertiliser dissolves in moisture (water) present in the soil.

Nitrate is mobile in the soil and moves with soil water. It is not strongly attracted to clay particles, and can be lost through leaching on well-drained light-textured sandy soils, should heavy rain fall or excess irrigation water be applied.

On heavy clay soils in inland cropping areas, such as the Wimmera and Darling Downs, nitrate is unlikely to be leached below the root zone of crops in most seasons.

In high rainfall areas, nitrate that is not utilised by plants may be washed into the soil below the root zone. Ultimately, it may reach and contaminate groundwater.

Nitrate can also be lost through denitrification (gaseous loss of nitrous oxide to the atmosphere) should the soil become waterlogged. For this reason, ammonium nitrate is not suitable for use in flood irrigated rice.

While most plants preferentially take up nitrate nitrogen, they may also take up ammonium nitrogen.

Once incorporated (or washed into the soil by rain or irrigation), ammonium nitrogen is adsorbed (attracted to and held tightly) on the surface of clay particles and soil organic matter (humus). It is not subject to leaching.

Ammonium is converted to nitrate by soil bacteria, usually within a few weeks of application. Being a biological process, the conversion occurs more slowly under cold temperatures, and if the soil is dry.

When fertilisers containing ammonium nitrogen are applied to the soil surface without incorporation in rain grown crops and pastures, or at times of the year when irrigation water is unavailable, some nitrogen can be lost to the atmosphere through the volatilisation of ammonia gas. Such losses are lower for ammonium nitrate than for other fertiliser containing all their nitrogen in the amide form (urea) or ammonium form, e.g. ammonium sulfate. Half the nitrogen in ammonium nitrate, that present as nitrate, is not subject to volatilisation.

When top-dressing with any nitrogen fertiliser, follow-up rain is needed to carry the fertiliser into the root-zone. However, should it remain dry for some time after application, plant recovery of applied nitrogen as ammonium nitrate is likely to be higher than for fertilisers containing all their nitrogen as amide or in the ammonium form.

Applying nitrogen fertiliser just before or with irrigation water will largely eliminate the potential for volatilisation losses, by carrying the fertiliser into the soil.

Volatilisation losses are higher on alkaline (high pH) soils than on acid soils.

Ammonia volatilisation losses from urea can be high in ratoon sugarcane when it is harvested green, the trash is retained as a blanket, and the fertiliser is broadcast over the trash without incorporation into the soil. Cal-Am is often used instead of urea where nitrogen fertiliser is surface-applied over sugarcane trash to minimise volatilisation losses.

On acid soils that are low in calcium, the calcium carbonate in Cal-Am may be of nutritional value. The calcium carbonate (lime) also has some neutralising value. Cal-Am is not as acidifying per kg of nitrogen as urea or straight ammonium nitrate.

The calcium carbonate in Cal-Am is of little value on alkaline soils, where any soil reactions involving calcium carbonate are slowed or completely blocked.

As a source of calcium, Cal-Am is unsuitable for use as a side-dressing fertiliser where a quick response to calcium is required in high value horticultural crops on acid soils low in calcium, as it takes time for the calcium to become available in the soil. More soluble fertilisers such as calcium nitrate can be used in these situations.

Planting fertilisers based on superphosphate (single or triple superphosphate) also supply calcium in more soluble and plant-available forms than Cal-Am.

4. APPLICATION

Ammonium nitrate can be applied in many ways and times.

It can be applied dry to the soil, and in solution. It is, for example, used as a constituent in the preparation of Urea Ammonium Nitrate (UAN) Solution, i.e. EASY N.

The solid ammonium nitrate products marketed by Incitec Pivot are intended for dry application to the soil.

Cal-Am contains approximately 20% calcium carbonate, which is insoluble. Consequently, Cal-Am is unsuitable for application in solution, e.g. in fertigation programs (dissolved in irrigation water).

While ammonium nitrate fertilisers can be applied at many times, their higher price (per kg of nitrogen) compared to urea and anhydrous ammonia dictates how and when they are applied. Unless the presence of nitrate nitrogen is likely to give a better response, ammonium nitrate fertilisers are unlikely to be used.

The premium for ammonium nitrate may be justified:

- Where a quick response to nitrogen (as nitrate) is required. Ammonium nitrate fertilisers are often used for side-dressing short season vegetable crops, and in winter when the conversion of ammonium nitrogen to nitrate is slowed.
- Where volatilisation of ammonia is likely; i.e. where fertiliser is top-dressed onto the soil surface of rain-grown pasture and crops without incorporation, particularly during drier times of the year, when rain is less reliable. This also applies to irrigated crops and pastures in southern Australia at times of the year when Water Resources do not supply water. Volatilisation losses are higher on alkaline soils than on acid soils. In sugarcane, volatilisation losses can be high when urea is applied over the top of trash blankets in ratoons.

Urea (46% N) is more concentrated than ammonium nitrate, providing savings in freight, storage and application. Urea costs less per kilogram of nitrogen.

Urea also has a higher critical relative humidity, meaning it is less likely to absorb moisture. Consequently, urea has better storage and handling characteristics than ammonium nitrate.

Ammonium nitrate fertilisers are not commonly used:

× Pre-plant

Urea or Big N (anhydrous ammonia) are normally used in preference to ammonium nitrate where nitrogen is applied pre-plant into the soil. As the fertiliser is placed into the soil (eliminating the potential for volatilisation losses), and there is time for the ammonium to be converted to nitrate in advance of the main growing season, there is no advantage to be gained from using ammonium nitrate.

× Planting

Ammonium nitrate compounds are not generally recommended for use in blended NP and NPK fertilisers for use at planting:

- Firstly, the blends have poor physical attributes, and do not store well.
- Secondly, there are limits to how much nitrogen can be applied safely at planting without affecting germination and emergence. The use of an ammonium phosphate fertilisers (MAP or DAP) to supply phosphorus will usually provide sufficient starter nitrogen. The balance of the crop's nitrogen requirement can be applied pre or post-planting. If additional nitrogen is required in the basal planting fertilisers for vegetable crops, e.g. where single or triple

superphosphate is used as the phosphorus source, it is normally recommended that Gran-am (granulated ammonium sulfate) be used, as the resultant blends have a better physical quality and store better. Urea is usually used in blends for grain and cotton where there is a need for extra nitrogen, as it is a more economical source of nitrogen.

Ammonium nitrate fertilisers are mostly used after the crop or pasture has been established:

✓ Horticultural Crops

Ammonium nitrate is popular for side-dressing vegetables where a quick response is required; and in tree and plantation crops, particularly where volatilisation losses are possible, e.g. where the fertiliser cannot be irrigated into the soil. In bananas, rain or overhead irrigation water may be deflected by the leaves, resulting in uneven wetting of the soil. Volatilisation losses are possible from those areas of soil that are not properly wetted.

As with any other fertiliser that is spun over vegetable crops; i.e. applied by a spreader (spinner-broadcaster), ammonium nitrate fertilisers should be applied when the leaves are dry, so that as few granules as possible remain on the leaves. Ideally, the crop should be irrigated immediately afterwards to wash off any fertiliser that lodges on the leaves. This reduces the likelihood of leaf burn.

✓ Top-dressing Pasture, Forage and Grain Crops

When urea or ammonium-containing nitrogen fertiliser are surface-applied and cannot be incorporated, gaseous atmospheric losses (volatilisation) can occur. Such losses are greatest on alkaline soils, i.e. at high pH.

Volatilisation losses can be prevented when the fertiliser is irrigated in after application, or applied with the irrigation water. In these situations, urea will normally be used.

Where irrigation is not possible, it may be better to use an ammonium nitrate fertiliser instead of urea, as it is less subject to volatilisation, particularly during the drier months of the year.

Ammonium nitrate may also give a quicker response than urea in cold weather, e.g. to provide quicker feed in winter forage crops and pasture.

✓ Ratoon Sugarcane

Urea is the product of choice if nitrogen fertiliser is to be applied into or covered with soil, e.g. when side-dressing plant sugarcane, applied split-stool or into the soil beside the crop row in ratoons, or irrigated in immediately after surface application.

Where urea is surface-applied over a trash blanket without incorporation, volatilisation losses can be appreciable. Cal-Am is often preferred in this situation.

A range of non-SSAN Blends, based on Cal-Am, are available for use in ratoon sugarcane.

5. STORAGE CHARACTERISTICS

Critical Relative Humidity

Ammonium nitrate fertilisers do not have good storage characteristics. Compared to many other fertilisers, ammonium nitrate has a low Critical Relative Humidity (CRH).

The CRH of blends containing ammonium nitrate will be lower than for ammonium nitrate itself.

Ammonium nitrate fertilisers and blends should be ordered as required and used quickly. They should not be stored for any length of time.

Once bagged, the product may set quickly.

Heat Cycling

Ammonium nitrate fertilisers are subject to heat cycling. If fertilisers containing ammonium nitrate are subjected to diurnal changes during which the temperature exceeds 33° C, phase changes in the crystal structure of the ammonium nitrate will occur. In the evening or night, when the temperature falls, the ammonium nitrate reverts to its original crystal structure. This results in gradual and irreversible breakdown of the fertiliser particles. Eventually the granules become shattered.

The degradation will be most evident towards the edges of the packs, which have been exposed to more heating.

Ammonium nitrate fertilisers and blends should not be stored in the open, placed in sheds so that they are exposed to direct sunlight, or against the walls or rooves of buildings where extreme and fluctuating temperatures are experienced.

6. COMPATIBILITY WITH UREA

Urea and ammonium nitrate fertilisers are incompatible in dry blends, as the resultant blend has a depressed Critical Relative Humidity and will rapidly absorb moisture. They should not be mixed together.

WARNING:

The information contained in this publication is for use as a guide only. The use of fertilisers is not the only factor involved in producing a top yielding pasture or crop. Local soil, climatic and other conditions should also be taken into account, as these could affect pasture or crop responses to applied fertiliser.

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