

LIQUID FERTILIZERS

6.1	Introduction	2
6.2	Benefits of liquid application	3
6.3	Specifications	4
6.4	Basic Formula	5
6.5	Product Comparisons	6
6.6	Compatibility	10
6.7	Applying Liquid Fertilizers	12
6.8	Sprayer Calibration	15
6.9	Spray Drift	16
6.10	Equipment	16
6.11	Machinery Maintenance	17
6.12	Storage	18
6.13	Safety and Handling	18
6.14	Placing an Order	18
6.15	Contacts	19
6.16	Material Safety Data Sheets	20

6.1 INTRODUCTION

Summit UAN: Summit Fertilizers Nitrogen boosting liquid. It is suitable for broad acre application either pre sowing or post crop germination. UAN offers a higher level of Nitrogen option to farmers looking for increased application windows and flexibility.

MAXamFLO: This is Summit and Western Australia's first broad acre liquid nitrogen and sulphur fertilizer. This product has been designed for use in broad acre situations. It can be applied through a boomspray or by injection.

These products have been designed with the farmer's needs in mind. Both products are easy to handle and use. MAXamFLO and Summit UAN can be mixed with a variety of chemicals, which may lead to efficiency gains in chemical application and timing. The Nitrogen and Nitrogen / Sulphur range promote growth during early part of the season, this can transform into yield or protein.



6.2 BENEFITS OF LIQUID APPLICATION

Economic – Reduced staff requirements (No need for a spreading operator or machinery) Contractors charge up to \$4.00 ha and may not be available when you require them. Boom spray on farm already.

Timing – Application using the farmers boom spray, available when required and is able to cover large areas quickly.

Even application – Spray patterns and use of foam markers or GPS technology generally enables farmers to cover the whole paddock, with higher levels of accuracy and with even rates per hectare. No stripping effects or missed sections due to wind etc.

Can be loaded into the boom and applied to paddock during periods of rainfall unlike granules. (Most of the uptake is still via the roots of the crop.)

Storage – Liquids are dust free, are not effected by outside moisture and are used in an enclosed system preventing contamination. Quality of the product in the tank remains constant from the day of delivery until day of use. (Unless the tank core temp drops below salting point generally around 2° C)

Availability of product to the crop. Each droplet contains nutrients which when spread in a fine pattern over the soil or the crop offers 10 to 20 times more sites per square metre than granular application. Deep banded application as a sausage tube along the length of the row allows the plant roots continual sites of contact compared to spaced granular application

Nutrients in liquids are generally in an immediate form for uptake into the plants. ie Sulphate sulphur.

6.3 SPECIFICATIONS

MAXamFLO is made up of a combination of liquid ammonium sulphate and urea. This gives the product a clear to light brown colour. As the combination of these two products is a lot heavier than water this gives MAXamFLO a specific gravity (bulk density) of 1.26kg/ltr (1.26 tonnes per cubic metre).

Summit UAN is a combination of dissolved ammonium nitrate and urea. It is a clear to light yellow liquid that has a specific gravity of 1.32 kg/ltr (1.32 tonnes per cubic metre).

Nutrient Content

% WEIGH BY WEIGHT	N	P	K	S	ZN	KG/LTR
MAXamFLO	22.5			6.7		1.26
Summit UAN	32					1.32
MAXamFLO	28.4			8.4		1.26
Summit UAN	42					1.32

The above table gives the nutrient analysis by the weight/weight measurement and the weight/volume measurement.

6.4 BASIC FORMULA

The table on the previous page can be used to correctly calculate the required rate of product to be applied by using a simple formula. The table that will be of most use is the **% weight by volume** table.

The following formulae can be used to calculate the desired rate of a product in litres per hectare or kilograms per hectare. They can also be used to calculate the nutrients being applied at a given rate per hectare.

1. This formula is used to calculate the equivalent kilograms per hectare for litres applied per hectare. As the product is sold in tonnes it is a very useful tool to calculate the required amount of product needed.

Rate in litres x bulk density = kg/ha

E.g. 50 lts x 1.26 = 63 kg/ha

2. This formula is used to calculate the equivalent litres per hectare needed to apply a given kilogram per hectare rate.

$\frac{\text{Kg/ha}}{\text{Bulk density}} = \text{lts/ha}$

E.g. 63kg/1.26 = 50 lts/ha

3. To calculate the amount of nutrient applied at given litres per hectare in a product the following formula should be used. In this formula the **% weight by volume** table should be used.

UAN at 130 litres per hectare.

$\frac{\text{Rate in litres per hectare} \times \% \text{ nutrient}}{100} = \text{Kg nutrient per hectare}$

E.g. $\frac{130 \times 42 \text{ N}}{100} = 54.6 \text{ kg Nitrogen per hectare}$

4. To calculate the amount of nutrient applied at given kilograms per hectare in a product the following formula should be used. In this formula the **% weight-by-weight** table should be used.

UAN at 172 kilograms per hectare.

$\frac{\text{Rate kilograms per hectare} \times \% \text{ nutrient}}{100} = \text{Kg nutrient per hectare}$

E.g. $\frac{172 \text{ kg} \times 32 \text{ N}}{100} = 55 \text{ kg Nitrogen per hectare}$

6.5 PRODUCT COMPARISONS

6.5.1 Summit UAN vs Urea

This table gives a rate comparison between Summit UAN and Urea comparing equivalent rates of Nitrogen for each product.

Summit UAN			Urea	
Kg/ha	L/ha	N	Kg/ha	N
10	7.5	3.2	7.0	3.2
20	15.0	6.4	13.9	6.4
30	22.6	9.6	20.9	9.6
40	30.1	12.8	27.8	12.8
50	37.6	16.0	34.8	16.0
60	45.1	19.2	41.7	19.2
70	52.6	22.4	48.7	22.4
80	60.2	25.6	55.7	25.6
90	67.7	28.8	62.6	28.8
100	75.2	32.0	69.6	32.0
110	82.7	35.2	76.5	35.2
120	90.2	38.4	83.5	38.4
130	97.7	41.6	90.4	41.6
140	105.3	44.8	97.4	44.8
150	112.8	48.0	104.3	48.0
160	120.3	51.2	111.3	51.2
170	127.8	54.4	118.3	54.4
180	135.3	57.6	125.2	57.6
190	142.9	60.8	132.2	60.8
200	150.4	64.0	139.1	64.0

6.5.2 MAXamFLO vs Amsul

This table gives a rate comparison between MAXamFLO and Amsul comparing equivalent rates of Nitrogen and Sulphur for each product.

MAXamFLO				Amsul		
Kg/Ha	L/ha	N	S	Kg/Ha	N	S
10	8.2	2.25	0.67	10.8	2.25	2.6
20	16.4	4.50	1.34	21.5	4.50	5.1
30	24.6	6.75	2.01	32.3	6.75	7.7
40	32.8	9.00	2.68	43.1	9.00	10.3
50	41.0	11.25	3.35	53.8	11.25	12.9
60	49.2	13.50	4.02	64.6	13.50	15.4
70	57.4	15.75	4.69	75.4	15.75	18.0
80	65.6	18.00	5.36	86.1	18.00	20.6
90	73.8	20.25	6.03	96.9	20.25	23.2
100	82.0	22.50	6.70	107.7	22.50	25.7
110	90.2	24.75	7.37	118.4	24.75	28.3
120	98.4	27.00	8.04	129.2	27.00	30.9
130	106.6	29.25	8.71	140.0	29.25	33.4
140	114.8	31.50	9.38	150.7	31.50	36.0
150	123.0	33.75	10.05	161.5	33.75	38.6
160	131.1	36.00	10.72	172.2	36.00	41.2
170	139.3	38.25	11.39	183.0	38.25	43.7
180	147.5	40.50	12.06	193.8	40.50	46.3
190	155.7	42.75	12.73	204.5	42.75	48.9
200	163.9	45.00	13.40	215.3	45.00	51.5

6.6 COMPATIBILITY

There are two major issues involved in compatibility.

- 1) Possible pesticide failure due to the speed of uptake when the carrier is a boosting nutrient. (ie. SU herbicides work on ryegrass by blocking the ALS growth enzyme) A boost of nitrogen could counter the desired effect of the herbicide.
- 2) The second is a reaction in the tank when we mix solutions of different formulation types. For broad acre users this is the most noticeable because when flocculation and layering which occurs between incompatible products, you notice physical blockages.

Liquid Fertilizer solutions have a higher ionic strength than water. The ionic strength of a solution is important in determining whether emulsifiable concentrate chemicals (EC's) are likely to be stable, as ionic strengths of greater than 50% readily break emulsions. The total concentration of dissolved salts in **MAXamFLO** is 77% w/v or 770g/L. The dissolved salts in liquid fertilizer products like **Summit UAN** (Urea Ammonium Nitrate) contain 80% w/v or 800g/L. Therefore formulations of MAXamFLO or Summit UAN can be unstable when mixed with EC's.

Once EC's are destabilised in the spray tank, separation between fertilizer solution and the chemical can occur. If the agitation/recirculation system is poor, (below 300 ltrs/min) there may be a "layering" of products in the spray tank. This could potentially lead to jet and filter blockages or even unsatisfactory application of the chemical across the paddock.

Diluting these fertilizers with water and increasing the rate of application, and increasing the total water concentration, may improve the compatibility for some emulsifiable concentrates especially with higher agitation.

Chemicals that are water based, such as Glyphosate are stable when mixed with MAXamFLO and Summit UAN. Some trace element solutions also appear to be stable.

The ionic strength of a fertilizer solution can be altered with the addition of water to the total spray volume. This addition of water may assist in the physical stability of some chemicals when mixed with high ionic strength solutions. It is anticipated that at least 50 litres of water would need to be added to 100 litres of MAXamFLO and Summit UAN to prevent "layering" of EC's in the spray tank. Similarly, it is anticipated that at least 60 litres of water would need to be added to 100 litres of Summit UAN to prevent "layering" of EC's by bringing the dissolved salts down below 500g/L. The addition of a wetter to the solution may also assist in stabilising the solution.

The following products have been field-tested and are stable in solution with MAXamFLO and Summit UAN.

Glyphosate	SpraySeed*
Glean	Ally
Impact	

The following products are reported as stable in solution with MAXamFLO and Summit UAN as long as there is very good agitation and it is recommended that they be premixed with a minimum of 20 l/ha of water before the MAXamFLO or Summit UAN is added to the mix.

Trifluralin	Pendamethalin
Ester 80	MCPA LVE

Do not add wetter to MAXamFLO or Summit UAN, as this will cause stripping of pesticides out of solution. It may also enhance phyto leaf burn on the crop.

Growers are advised to do a jar test to check compatibility if MAXamFLO or Summit UAN are to be substituted for water.

***Note:** It has been noticed that mixing SpraySeed with MAXamFLO and Summit UAN plus an EC formulated insecticide (Cypermethrin) is incompatible. This mixture will result in a jelly like substance and will settle out in the spray tank. Even SpraySeed alone appears to layer, further testing is being conducted.

Compatibility data is being sourced from trials that have been done in past years and are currently being done with the help of chemical companies. As this data becomes available from the trial work it will be updated through out this manual.

***Note: A compatibility chart is located at the end of this manual.**

The chart does not suggest pesticides should be used with liquid fertilizers. It is a record of farmer experiences and our jar testing trials in the lab.

6.7 APPLYING LIQUID FERTILIZERS

MAXamFLO and Summit UAN can be used through seeding equipment by banding away from the seed (suggest 5- 10 centimetres) or through a boomspray either pre or post seeding.

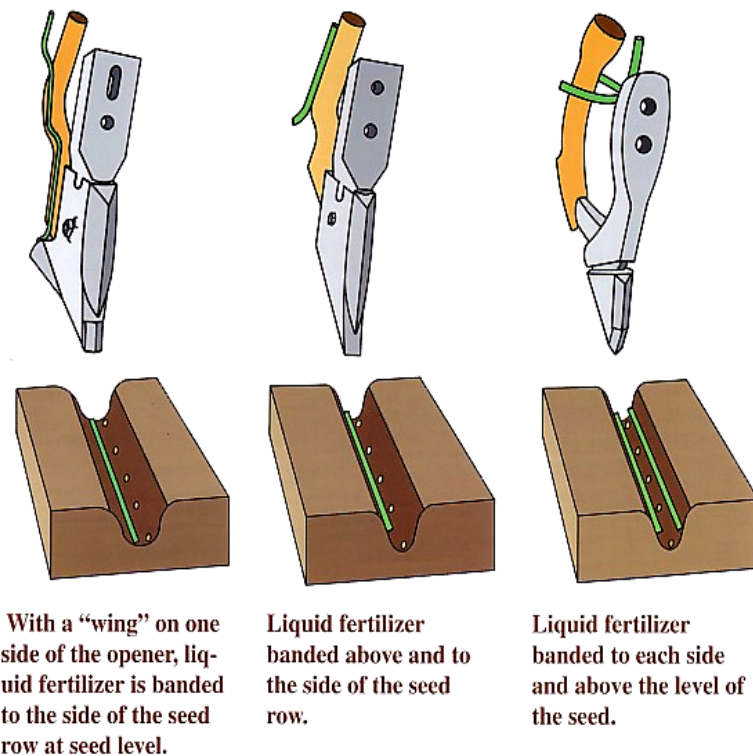
When injecting MAXamFLO or Summit UAN it is advised to use no more than 100 litres per hectare to avoid seedling damage. Trials have shown that rates beyond 130 litres per hectare can damage some seedlings especially if nozzles move and spray too close to the seed.

When using a foliar application you need to mix additional water (at least 20%) with the required rate of MAXamFLO or Summit UAN, to assist with crop safety and reduce leaf burn. If spraying advanced crops, it is advised to use the 'clover leaf' turning method of spraying and any other double application.

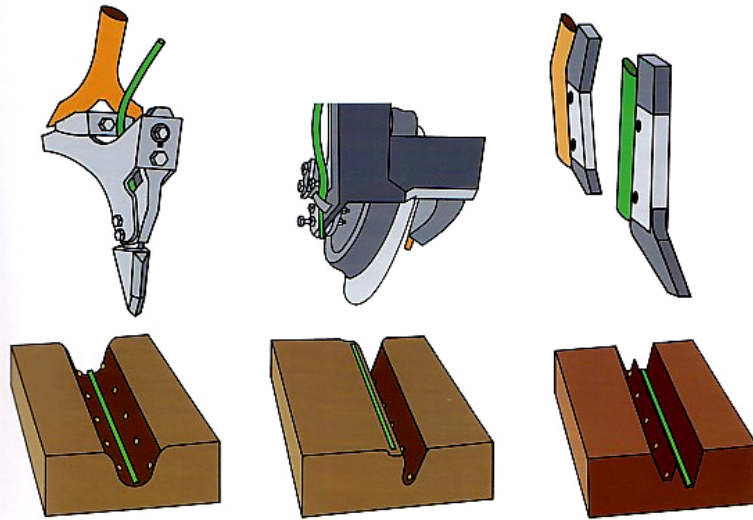
Applying MAXamFLO or Summit UAN pre seeding with a knockdown (such as Glyphosate) is a very efficient way of applying the nitrogen needed by the plant at its early stages of growth.

MAXamFLO or Summit UAN can also be used as a late application of nitrogen to enhance protein levels in wheat. Used at high rates (40-50 litres per hectare) as a foliar spray it can be used as a carrier for Impact® to control leaf diseases in cereal crops.

Liquid Fertilizer Placement While Seeding



Liquid Fertilizer Placement While Seeding



Liquid fertilizer placed below and in the middle of a paired seed row.

Very low disturbance, single disc opener, the liquid fertilizer is banded above and to the side of the seed row.

Two independant openers, one for the seed the other for the fertilizer. The liquid fertilizer is placed below and to the side of the seed.

This is ideal for MAXamFLO and Summit UAN

These two systems are ideal for MAXamFLO and Summit UAN.



This is an example of one method of applying liquid fertilizer. This system applies the fertilizer directly behind the press wheel in a steady stream. By doing this you are getting very even distributions of nutrient where it is needed.



This is an example of a liquid injection system that is suitable for all products. The depth of the fertilizer can be adjusted to suit the various types of product. UAN and MAXamFLO need to be placed 50 to 75 mm away from the seed.

6.8 SPRAYER CALIBRATION

As with normal calibration the application equipment needs to be calibrated to the different flow rates of liquid fertilizers.

As the viscosity of these liquids is so much higher than water, the flow rates at the same pressure as water will be less. Therefore, to get the same volume of liquid out of the same jet the pressure will need to be higher. The pressure has to be adjusted to maintain the spray pattern of the commonly used 110-degree flat fan nozzles. Spray controllers on most application equipment will make the adjustments automatically. However if the process has to be worked out manually there is a simple formula to calculate the pressure required.

The formula is as follows:

Liquid Fertilizer pressure = water pressure x specific gravity

MAXamFLO Pressure = water pressure x 1.26

$$300 \text{ Kpa} \times 1.26 = 378 \text{ Kpa}$$

This formula will work for any jet size as long as the water pressure is known at a given volume in litres per minute.

The following formula will allow you to select the correct nozzle size by calculating the correct flow rate required per nozzle. Because of the different density of liquid fertilizers a conversion factor needs to be used to calculate the required flow rate.

Conversion Factors

Fertilizer	Density-kg/l	Conversion factor
MAXamFLO	1.26	1.11
Summit UAN	1.32	1.20
Water	1.00	1.00

When you multiply the desired application rate by the conversion factor this will give a flow rate equivalent to water. This will allow you to select the right nozzle for the flow rate.

For example:

65 lts/ha MAXamFLO x 1.11(conversion factor) = water flow rate

$$65 \times 1.11 = 72 \text{ lts/ha water.}$$

This means that to apply 65 l/ha MAXamFLO a nozzle that can apply 72 l/ha of water will be needed.

The above formulae can also be used to calibrate machinery that is designed for injection only. The only difference is that instead of using flat-fan jets, the correct flow regulator will have to be selected. Flow regulators are designed for the application of liquid fertilizers and fumigants. These can either be mounted behind the tine or at the manifold on the cultivator bar.



The picture above shows a typical manifold setup with the flow regulators mounted at the manifold with the delivery hoses going down the back of the tyne as shown below. With this system the hoses do not have to be of equal length as the amount of liquid applied is controlled at the manifold. If there were no flow regulators in the system, all the hoses from the manifold to the back of the tyne would have to be of equal length as the liquid would take the path of least resistance, resulting in an uneven application of product.

6.9 SPRAY DRIFT

As with all operations involving spraying the operator should be aware of potential spray drift problems. It appears that MAXamFLO and Summit UAN will behave similarly to water under high pressures and flow rates. It is therefore advisable to be aware of weather conditions that could lead to spray drift and the potential to damage non-target crops especially if there is a pesticide being used.

6.10 EQUIPMENT

As all of these products are highly corrosive to mild steel, brass and copper, it is recommended that the products only be used with stainless steel, ceramic, PVC plastic and chemically resistant filters. Liquid fertilizers need higher pressures to deliver the same volume of liquid as water. Therefore it is recommended that the pumps on the machinery be of a high standard. Pumps are available that have all surfaces that come into contact with liquid fertilizers made from polypropylene or stainless steel.

Filters on machinery need to be able to withstand acidic conditions. Preferably the filters should be made of high-grade (316) stainless steel or acid resistant plastics such as polyethylene or polypropylene.



6.11 MACHINERY MAINTENANCE

It is recommended that the machinery be cleaned down daily with water to prevent corrosion, as all of these products are very corrosive. An application of water-soluble oil (spray oil) will also help in preventing corrosion.

Spray lines and tanks should be flushed daily to prevent '**salting out**' of the product. '**Salting out**' is a change in physical state from a solution to solid crystal, which can cause handling and application problems.

MAXamFLO and Summit UAN are tested stable at 3 C degrees. Operators should be aware of external temperatures that fall lower than this, especially on exposed pipes on machinery. In these cases 'salting out' can occur due to evaporation and will cause blockages if liquid fertilizer is left standing in exposed pipes under frosty conditions. This process can be very rapid under these conditions.

6.12 STORAGE

MAXamFLO and Summit UAN are corrosive to mild steel, brass and copper. Storage in stainless steel, PVC plastic or chemically resistant fibreglass is required. Tanks need to be of heavy-duty, reinforced construction suitably approved for high specific gravity products.

Tank Installation

Tank delivery trucks require a minimum of 5.3 m height clearance.

There must be two people on site to assist with delivery.

There should be a clear smooth area adjacent to the pad to allow for unloading and manoeuvring the tank into position. This area will serve as road-train access for filling the tank after installation.

Tank site should have clearance from buildings, watercourses, fuel storage facilities and any other structures.

Bund wall should not be raised until after delivery of the tank so as not to restrict access.

Tank must be tied down immediately after delivery and gravel should be placed around the edge to prevent sand pad from being eroded by wind or water.

6.13 SAFETY AND HANDLING

MAXamFLO and Summit UAN are not classified as dangerous goods. Therefore there are no special transport and storage requirements. However all of these products should be handled with care in accordance with other chemicals.

It is recommended when handling these products that eye protection, gloves and chemically resistant clothing should be worn as these products could cause mild irritation to the skin and eyes.

In the likelihood of these products coming into contact with the skin or eyes it is recommended that a source of fresh water be on hand to rinse off any product.

6.14 PLACING AN ORDER

Summit Fertilizers are treating liquid products exactly the same as granular products when placing an order. Liquid products will receive the same contract benefits as granular products. These include volume discounts, payment discounts and seasonal variations. Prices are stated in the current price list and like granular product are active on the day of dispatch, not locked on day of payment.

The following processes should be followed when placing an order for any of our liquid products.

The order is to be placed with the Agent electing preferred month of pickup, payment option and distance from Summit Kwinana. This information is then sent onto the customer service department in Kwinana.

An Agent Fertilizer Payment Advice form is then faxed to Customer Service Kwinana when payment is received, prior to product being dispatched. Payment option BC (carrier bringing cheque) cannot be accepted by delivery driver.

The customer will be contacted by Summit's Customer Service department to confirm the time and date of dispatch, location of tank and whether the tank is completely empty prior to booking transport for you.

Note: Load sizes are set by the cartage contractor and are therefore restricted to 25 and 50 tonne loads.

6.15 CONTACTS

For assistance with any aspect of liquid fertilizers, contact our Area Manager team or phone Kwinana Depot on 1800 198 224 or 9439 8999

6.16 MATERIAL SAFETY DATA SHEETS

Section 1- Product Information

Product: **MAXamFLO**
Typical Analysis: 22.5%N, 6.7%S
Chemical Formula: $(\text{NH}_4)_2\text{SO}_4 \text{ NH}_4\text{CONH}_2 \text{ H}_2\text{O}$
Composition: Solution of Ammonium Sulphate and Urea
Physical Properties: Clear, colourless liquid
Bulk Density: 1.26 Tonnes/m³

Section 2 – Precautionary Measures

Avoid ingestion
Avoid excessive contact with skin or eyes
Use adequate ventilation

Personal Protection

Skin Protection: Protect open wounds.
Eye Protection: Monogoggles should be worn.

Section 3 – Emergency & First Aid Procedures

If In Eyes: Flush with water for 15 minutes. If irritation occurs and persists, seek medical attention.

If On Skin: Wash contaminated area with water. If irritation persists after washing, seek medical attention.

If Ingested: Wash mouth out with water, seek medical attention.

MATERIAL SAFETY DATA SHEET

SECTION 1 – PRODUCT INFORMATION

Product:	UAN
Typical Analysis:	32%N
Chemical Name:	Urea Ammonium Nitrate
Composition:	Aqueous solution of Ammonium Nitrate and Urea
Physical Properties:	Clear, colourless liquid
Bulk Density:	1.3 tonnes/m ³

SECTION 2 - PRECAUTIONARY MEASURES

Avoid ingestion
Avoid contact with skin or eyes
Use adequate ventilation

Personal Protection

Skin Protection:	Wear PVC gloves. Protect open wounds.
Eye Protection:	Monogoggles should be worn to avoid eye contact.

SECTION 3 – EMERGENCY & FIRST AID PROCEDURES

If In Eyes:	Flush with water for 15 minutes. If irritation occurs and persists, seek medical attention.
If On Skin:	Wash contaminated area with water. If irritation persists after washing, seek medical attention.
If Ingested:	Wash mouth out with water, seek medical attention.

The data contained in this Material Safety Data Sheet was correct at time of issue and relates solely to the specified product and its use as a fertilizer. Summit Fertilizers may update this information at any time.