

Fertilizer Products

Types of Fertilizers

Single Fertilizers

- Fertilizers that contain only one major nutrient are called straight or single-nutrient fertilizers
- For example:
 - Urea, which contains only nitrogen
 - Triple superphosphate, which contains only P_2O_5
 - MOP (Muriate of Potash), which contains only K_2O

Multi-Nutrient Fertilizers

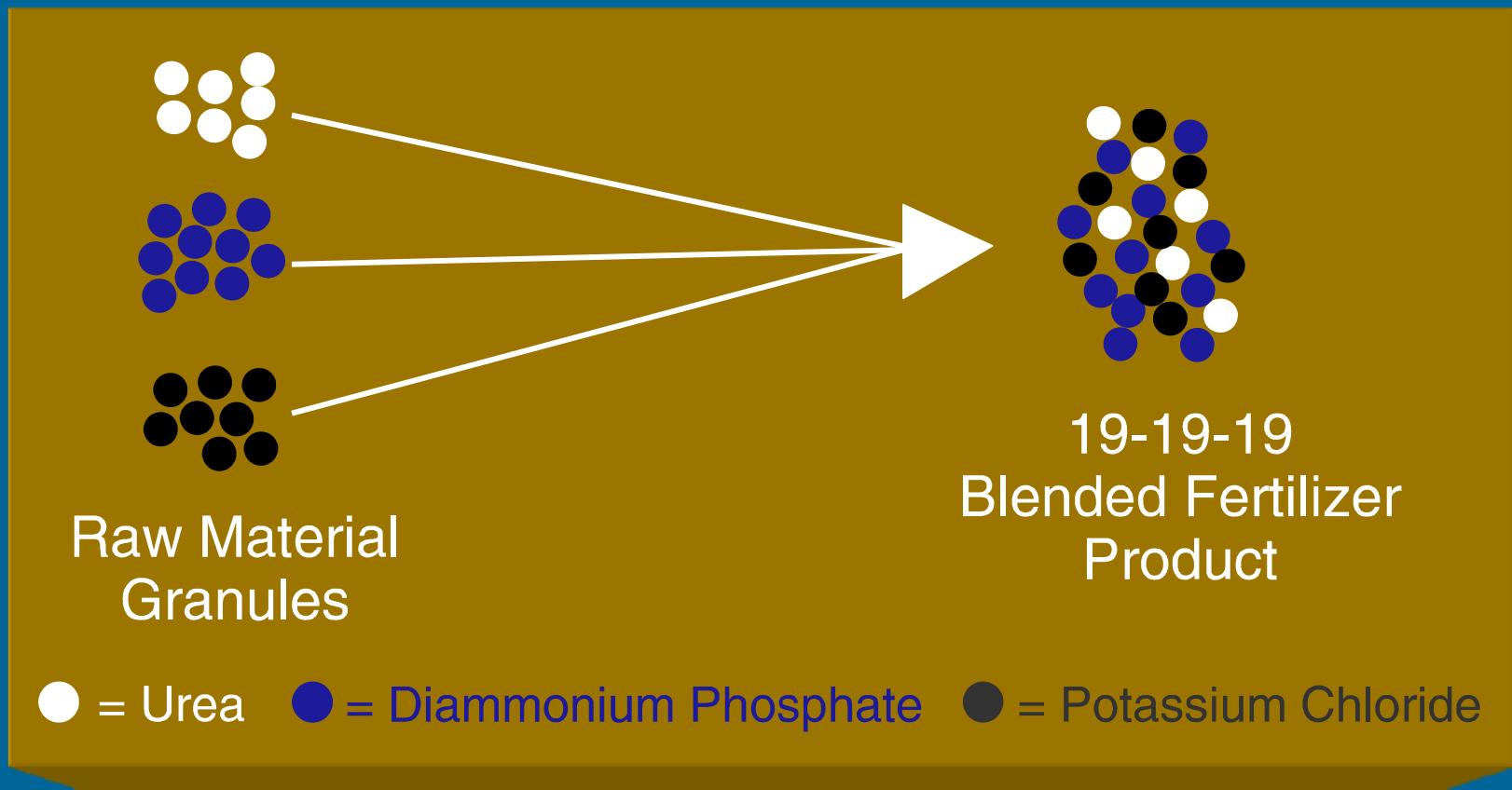
- Fertilizers that contain two or more major nutrients
- For example:
 - Diammonium phosphate, which contains nitrogen and P₂O₅
 - NPKs, which contain all three major nutrients

Multi-Nutrient Fertilizers

Multi-nutrient fertilizers can be produced by:

- Dry bulk blending (physical mixing) of the separate components—such as urea; DAP and MOP are physically mixed to form NPKs
- Or they can be produced by chemical reaction to produce complex compound fertilizers—like reacting ammonia, phosphoric acid, and MOP to produce different grades of NPKs
- Or by dry or wet granulation of urea, DAP, and MOP to produce NPKs

Fertilizer Blending



Bulk Blends

- Physical mixtures
- Individual components retain their physical (shape and color) and chemical properties
- During transportation, the different components in the bags may separate with the finer product at the bottom and the bigger particles at the top

Fertilizer Materials Used in Bulk Blends

Material	Symbol	Chemical Formula	N	P ₂ O ₅	K ₂ O	S
Ammonium nitrate	AN	NH ₄ NO ₃	34	0	0	
Ammonium sulfate	AS	(NH ₄) ₂ SO ₄	21	0	0	24
Urea		NH ₂ CONH ₂	46	0	0	
Diammonium phosphate	DAP	(NH ₄) ₂ HPO ₄	18	46	0	
Monoammonium phosphate	MAP	NH ₄ H ₂ PO ₄	11	52	0	
Triple superphosphate	TSP	Ca(H ₂ PO ₄) ₂ · H ₂ O	0	46	0	
Muriate of potash	MOP	KCl	0	0	60	
Sulfate of potash	SOP	K ₂ SO ₄	0	0	50	17
Sulfate of potash magnesia	SPM	K ₂ SO ₄ · 2MgSO ₄	0	0	21	22

Incorporation of Micronutrients

Can coat the granules with:

- Beneficial micronutrients (Fe, Zn, Mn, ...)
- Plant growth regulators (PGRs)
- Biofertilizers/promoters, e.g., humic acids, amino acids, seaweed extracts

Compound Fertilizers

Compound Fertilizer

A mixed fertilizer containing at least two of the primary plant nutrients, N, P, and K, formed by mixing two or more fertilizer materials or granulating them together, usually by the processes that involve chemical reactions of the materials with each other.

Compound fertilizers are usually made in registered grades.

Importance of Compound Fertilizers

The decision to use compound fertilizers is usually driven by one or more of the following factors:

- Convenience (no segregation)
- Crop nutrient needs
- Government policy objectives
- Economics (more expensive)

Compound Fertilizer Perspectives

Advantages:

- Uniform granular size and spreading
- Easy method of analysis
- Can use various raw materials

Compound Fertilizer Perspectives

Disadvantages:

- No flexibility on smaller volumes
- Internal chemical stabilizers used to maintain granule integrity
- Limited formulation possibilities

Physically Blended NPK



Chemically Blended NPK



Prilled (urea, AN)



Granules (irregular shape, similar size)



Powder (e.g., SSP)

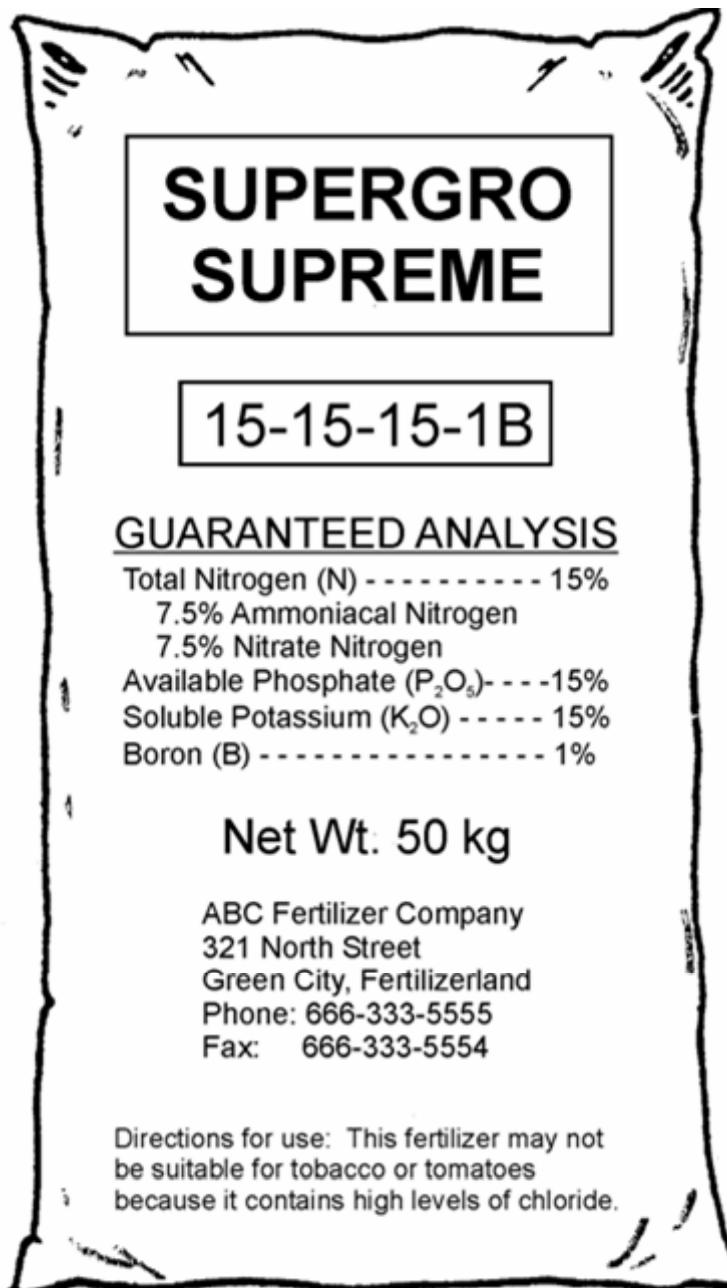


Crystalline



Fertilizers Labeling or Bag Markings

- **Name of Product in Bold letters**
- **Contents expressed in percentage**
- **(Primary, secondary or micronutrients)**
- **Gross/net weight of bag**
- **Name and address of manufacturer**
- **Expiry date if required by law**
- **Any other message**



Calculation of Nutrient Contents in a Fertilizer Bag

- 15:15:15:1B
- 50 kg bag contains:

$$\begin{aligned}15/2 &= 7.5 \text{ kg N} \\15/2 &= 7.5 \text{ kg P}_2\text{O}_5 \\15/2 &= 7.5 \text{ kg K}_2\text{O} \\1/2 &= 0.5 \text{ kg B} \\ \text{Total Nutrient} &= 23 \text{ kg}\end{aligned}$$



“Good Quality” of a Fertilizer:

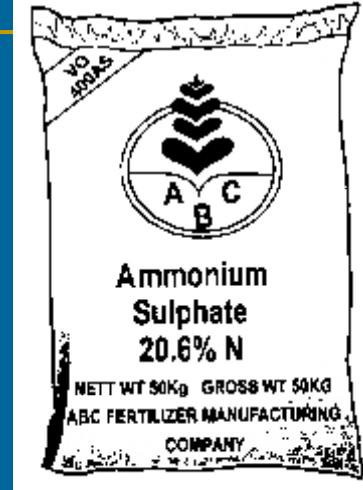
- The uniform appearance and size of particles, whether these are regular crystals, prills, or granules
- Little or no dust in the product
- Free-flowing characteristics with no caking or lump formation
- Low moisture content
- Nutrient contents in accordance with the claim on the label
- Neat, clean, and proper appearance of the package
- Correct weight in accordance with the claim on the label

How can I be sure that the fertilizer purchased is of good quality?

- You should purchase well-known brands of fertilizer.
- On taking delivery, inspect the bags to ensure that they are properly stitched and closed and that the fertilizer inside is dry and moves when pushed.
- Also, weigh a few bags to make sure they are the weight shown on the bag.

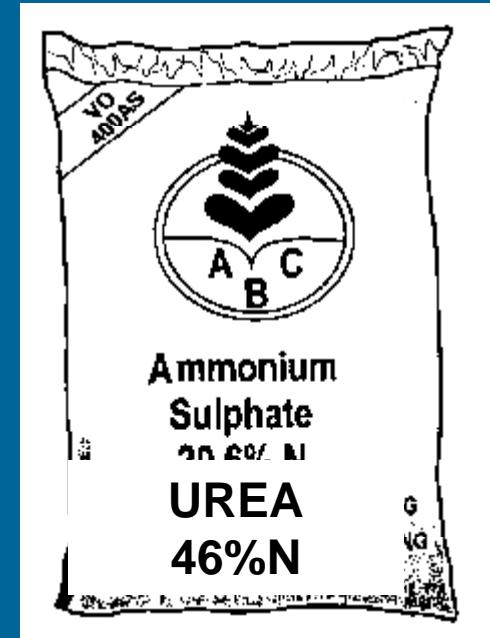
Ammonium Sulfate

- Fertilizer grade: 21-0-0 + 24 S
- White crystalline salt
- Water soluble
- Use 110 kg of lime to neutralize the effect of 100 kg of AS
- Free flowing
- No handling or storage problems
- Low hygroscopicity
- Can cake under high humidity
- Ingredient in many mixed fertilizers
- Do not use on acid sulfate soils
- Do not mix with seeds – hampers germination



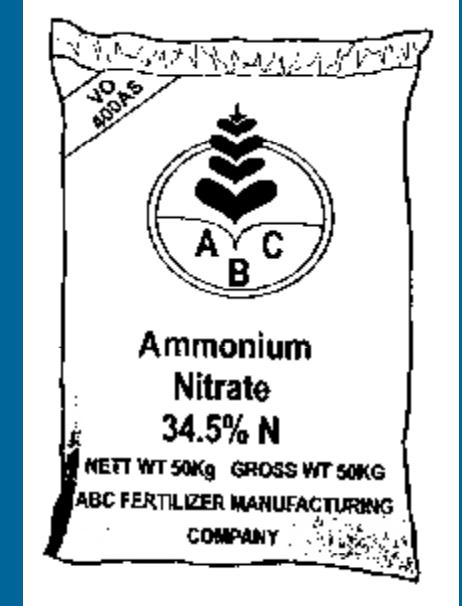
Urea

- Nutrient contents, 45%- 46%
- White prills or granules
- Water soluble
- Largely used nitrogenous fertilizer for top dressing (80%)
- Easy to apply
- Sulfur/neem-coated urea also available



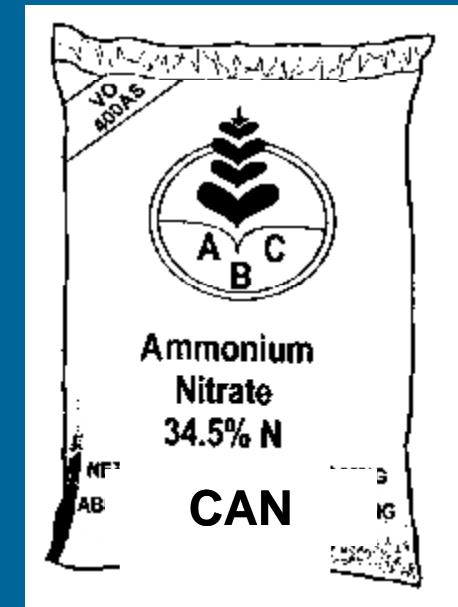
Ammonium Nitrate

- Fertilizer grade: 34-0-0
- Half of N is nitrate, half is ammonium
- White crystalline salt
- Water soluble
- It is hygroscopic
- Use 59 kg of lime to neutralize the effect of 100 kg of AN
- Can be a fire or explosive hazard when mixed with combustible materials
- Suited for most crops except wetland rice (denitrification)



Calcium Ammonium Nitrate

- CAN is ammonium nitrate diluted with calcium carbonate
- Fertilizer grade: 26-0-0
- 1/2 of N is nitrate, 1/2 is ammonium
- Grey or light brown due to coating to prevent caking
- Water soluble
- It is hygroscopic



SOP vs MOP

- SOP: Contains 50% K₂O, 18% S
- Low Cl content
- Ideal for use on Cl-sensitive crops or where Cl buildup is a problem
- MOP: Contains 60%-62% K₂O, 47% Cl (Correct name)

