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 $\text{P}_2\text{O}_5$
  - MOP (Muriate of Potash), which contains only $\text{K}_2\text{O}$
Multi-Nutrient Fertilizers

- Fertilizers that contain two or more major nutrients
- For example:
  - Diammonium phosphate, which contains nitrogen and P$_2$O$_5$
  - 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

Raw Material Granules

19-19-19 Blended Fertilizer Product

○ = Urea  ● = Diammonium Phosphate  ■ = Potassium Chloride
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

<table>
<thead>
<tr>
<th>Material</th>
<th>Symbol</th>
<th>Chemical Formula</th>
<th>N</th>
<th>P₂O₅</th>
<th>K₂O</th>
<th>S</th>
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<tbody>
<tr>
<td>Ammonium nitrate</td>
<td>AN</td>
<td>NH₄NO₃</td>
<td>34</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Ammonium sulfate</td>
<td>AS</td>
<td>(NH₄)₂SO₄</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>24</td>
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<tr>
<td>Urea</td>
<td></td>
<td>NH₂CONH₂</td>
<td>46</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Diammonium phosphate</td>
<td>DAP</td>
<td>(NH₄)₂HPO₄</td>
<td>18</td>
<td>46</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Monoammonium phosphate</td>
<td>MAP</td>
<td>NH₄H₂PO₄</td>
<td>11</td>
<td>52</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Triple superphosphate</td>
<td>TSP</td>
<td>Ca(H₂PO₄)₂·2H₂O</td>
<td>0</td>
<td>46</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Muriate of potash</td>
<td>MOP</td>
<td>KCl</td>
<td>0</td>
<td>0</td>
<td>60</td>
<td></td>
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<tr>
<td>Sulfate of potash</td>
<td>SOP</td>
<td>K₂SO₄</td>
<td>0</td>
<td>0</td>
<td>50</td>
<td>17</td>
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<tr>
<td>Sulfate of potash magnesia</td>
<td>SPM</td>
<td>K₂SO₄·2MgSO₄</td>
<td>0</td>
<td>0</td>
<td>21</td>
<td>22</td>
</tr>
</tbody>
</table>
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

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Compound Fertilizer Perspectives

Disadvantages:

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

15-15-15-1B

GUARANTEED ANALYSIS
Total Nitrogen (N) - - - - - - - - 15%
7.5% Ammoniacal Nitrogen
7.5% Nitrate Nitrogen
Available Phosphate (P₂O₅) - - - 15%
Soluble Potassium (K₂O) - - - - 15%
Boron (B) - - - - - - - - - - - - - 1%

Net Wt. 50 kg

ABC Fertilizer Company
321 North Street
Green City, Fertilizerland
Phone: 666-333-5555
Fax: 666-333-5554

Directions for use: This fertilizer may not be suitable for tobacco or tomatoes because it contains high levels of chloride.
Calculation of Nutrient Contents in a Fertilizer Bag

- 15:15:15:1B
- 50 kg bag contains:
  - \( \frac{15}{2} \) = 7.5 kg N
  - \( \frac{15}{2} \) = 7.5 kg \( P_2O_5 \)
  - \( \frac{15}{2} \) = 7.5 kg \( K_2O \)
  - \( \frac{1}{2} \) = 0.5 kg B

Total Nutrient = 23 kg
ENGRO®

DAP (18:46:0)
Fertilizer

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“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

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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

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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)