# Product of the Month - BORON?

Importance of Boron in your Crop Nutrition Plan

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This month we are going to take a look not just a specific product that can influence your operation, but instead we are going to analyze the importan of **Boron** for crop production!


Boron is a critical yet often overlooked micronutrient in corn and soybean production. While macronutrients like nitrogen, phosphorus, and potassiu receive the most attention, Boron plays a vital role in plant development, particularly in cell wall formation, nutrient transport, and reproductive success. Without adequate Boron, crops can suffer from poor pollination, weak stems, and reduced grain or pod fill, ultimately limiting yield potentia and profitability.

Despite its importance, Boron deficiencies are becoming more prevalent du to soil depletion, intensive cropping practices, leaching, and simply becaus is not apart of peoples nutrition plan at all. Many farmers may not recogniz the symptoms of Boron deficiency until yield losses occur, making proactiv management essential.

This article aims to raise awareness of Boron's physiological functions, deficiency risks, and best application practices. By incorporating Boron int well-balanced fertility program, growers can optimize plant health, improv stress tolerance, and maximize yield potential. Whether you're a farmer looking to fine-tune your fertility strategy or a sales professional guiding customers toward better agronomic decisions, understanding Boron's role can lead to stronger, more profitable crops.

## Boron - What it does for the Plant:

Boron is an essential micronutrient that plays a crucial role in corn, soybea and wheat production, influencing plant growth, reproductive success, and overall yield quality. Below we list out the specific ways boron is used by th plant.

## Three Key Physiological Functions of Boron in Crop Productior

### Cell Wall Formation and Structural Integrity

- Boron is essential for **cell division, cell wall formation, and tissue development**, ensuring strong plant structure and resilience.

### Reproductive Development and Pollination

- Boron is **crucial for pollen germination, pollen tube growth, and seed set**, directly impacting successful fertilization and yield potential in both crops.

### Sugar Transport and Energy Flow

- Boron helps transport **sugars and carbohydrates from leaves to developing grains and pods**, supporting grain fill, seed development and overall plant energy balance.

Boron significantly interacts with key nutrients such as calcium, potassium and nitrogen, greatly affecting corn and soybean health and yields. With calcium, Boron strengthens cell walls, improving structural integrity, diseas resistance, and stress tolerance. **Insufficient Boron limits calcium effectiveness**, negatively impacting plant health. **Potassium supports Boroı uptake**, enhancing nutrient balance, drought tolerance, and reproductive success. Additionally, **Boron improves nitrogen utilization efficiency**, especially during critical reproductive stages. Without adequate Boron, nitrogen efficiency declines, reducing yield potential despite adequate nitrogen availability. Understanding these nutrient interactions enables growers to develop comprehensive fertility plans that optimize plant healtł nutrient efficiency, and overall crop performance.

Without sufficient Boron, plants struggle to perform these critical function leading to visible deficiency symptoms that can negatively impact crop hea and yield. Recognizing these signs early is essential for preventing yield los: and ensuring optimal plant development.

# Boron Needs - Soil Test Guidelines

**Soil Test Guidelines for Boron:**

- Low (<0.5 ppm)
- Medium (0.5–2 ppm)
- High (>2 ppm)

Corn Removal:

- 200 Bu Corn
  - Grain - .48 lbs of Boron
  - Stover - .06 lbs of Boron
  - Total - .54 lbs of Boron

One thing to point out in corn removal, look how much Boron is removed v grain versus stover. After harvest there is very little boron left to return to soil.

| CORN NUTRIENT REMOVAL - GRAIN ONLY (LBS) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bushels/Acre | 300 | 280 | 260 | 240 | 220 | 200 | 180 | 160 | 140 | 120 | 100 | 80 |
| Nitrogen (N) | 201 | 187.6 | 174.2 | 160.8 | 147.4 | 134 | 120.6 | 107.2 | 93.8 | 80.4 | 67 | 53 |
| Phosphate (P2O5) | 105 | 98 | 91 | 84 | 77 | 70 | 63 | 56 | 49 | 42 | 35 | 28 |
| Potassium (K2O) | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 |
| Sulfur (S) | 24 | 22.4 | 20.8 | 19.2 | 17.6 | 16 | 14.4 | 12.8 | 11.2 | 9.6 | 8 | 6.4 |
| Magnesium (Mg) | 9.99 | 9.32 | 8.66 | 7.99 | 7.33 | 6.66 | 5.99 | 5.33 | 4.66 | 4.00 | 3.33 | 2.6 |
| Calcium (Ca) | 4.05 | 3.78 | 3.51 | 3.24 | 2.97 | 2.70 | 2.43 | 2.16 | 1.89 | 1.62 | 1.35 | 1.0 |
| Copper (Cu) | 0.15 | 0.14 | 0.13 | 0.12 | 0.11 | 0.10 | 0.09 | 0.08 | 0.07 | 0.06 | 0.05 | 0.0 |
| Manganese (Mn) | 0.21 | 0.20 | 0.18 | 0.17 | 0.15 | 0.14 | 0.13 | 0.11 | 0.10 | 0.08 | 0.07 | 0.0 |
| Zinc (Zn) | 0.33 | 0.31 | 0.29 | 0.26 | 0.24 | 0.22 | 0.20 | 0.18 | 0.15 | 0.13 | 0.11 | 0.0 |
| Boron (B) | 0.72 | 0.67 | 0.62 | 0.58 | 0.53 | 0.48 | 0.43 | 0.38 | 0.34 | 0.29 | 0.24 | 0.1 |
| Iron (Fe) | 0.45 | 0.42 | 0.39 | 0.36 | 0.33 | 0.30 | 0.27 | 0.24 | 0.21 | 0.18 | 0.15 | 0.1 |

*N, P, K AND S NUMBERS COURTESY INTERNATIONAL PLANT NUTRITION INSTITUTE (IPNI). THESE NUMBERS ARE ESTIMATIONS. ACTUAL NUTRIENT REMOVAL MAY VARY BASED ON MANY FACTORS.

| CORN NUTRIENT REMOVAL - STOVER ONLY (LBS) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bushels/Acre | 300 | 280 | 260 | 240 | 220 | 200 | 180 | 160 | 140 | 120 | 100 | 80 |
| Nitrogen (N) | 135 | 126 | 117 | 108 | 99 | 90 | 81 | 72 | 63 | 54 | 45 | 36 |
| Phosphate (P2O5) | 48 | 44.8 | 41.6 | 38.4 | 35.2 | 32 | 28.8 | 25.6 | 22.4 | 19.2 | 16 | 12. |
| Potassium (K2O) | 330 | 308 | 286 | 264 | 242 | 220 | 198 | 176 | 154 | 132 | 110 | 88 |
| Sulfur (S) | 21 | 19.6 | 18.2 | 16.8 | 15.4 | 14 | 12.6 | 11.2 | 9.8 | 8.4 | 7 | 5.6 |
| Magnesium (Mg) | 60 | 56 | 52 | 48 | 44 | 40 | 36 | 32 | 28 | 24.0 | 20 | 16 |
| Calcium (Ca) | 39 | 36.4 | 33.8 | 31.2 | 28.6 | 26 | 23.4 | 20.8 | 18.2 | 15.6 | 13 | 10. |
| Copper (Cu) | 0.09 | 0.08 | 0.08 | 0.07 | 0.07 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 | 0.03 | 0.0 |
| Manganese (Mn) | 2.25 | 2.10 | 1.95 | 1.80 | 1.65 | 1.50 | 1.35 | 1.20 | 1.05 | 0.90 | 0.75 | 0.6 |
| Zinc (Zn) | 0.45 | 0.42 | 0.39 | 0.36 | 0.33 | 0.30 | 0.27 | 0.24 | 0.21 | 0.18 | 0.15 | 0.1 |
| Boron (B) | 0.09 | 0.08 | 0.08 | 0.07 | 0.07 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 | 0.03 | 0.0 |
| Iron (Fe) | 0.75 | 0.70 | 0.65 | 0.60 | 0.55 | 0.50 | 0.45 | 0.40 | 0.35 | 0.30 | 0.25 | 0.2 |

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## Soybean Removal:

- 60 Bu Beans
    - Grain - .07 lbs of Boron
    - Stover - .35 lbs of Boron
    - Total - .42 lbs of Boron

SOYBEAN NUTRIENT REMOVAL - GRAIN ONLY (LBS)

| Bushels/Acre | 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrogen (N) | 293 | 276 | 260 | 244 | 228 | 211 | 195 | 179 | 163 | 146 | 130 | 114 | 98 | 8 |
| Phosphate (P2O5) | 66 | 62 | 58 | 55 | 51 | 47 | 44 | 40 | 37 | 33 | 29 | 26 | 22 | 18 |
| Potassium (K2O) | 106 | 100 | 94 | 89 | 83 | 77 | 71 | 65 | 59 | 53 | 47 | 41 | 35 | 3 |
| Sulfur (S) | 16.2 | 15.3 | 14.4 | 13.5 | 12.6 | 11.7 | 10.8 | 9.9 | 9 | 8.1 | 7.2 | 6.3 | 5.4 | 4 |
| Magnesium (Mg) | 13.5 | 12.75 | 12 | 11.25 | 10.5 | 9.75 | 9 | 8.25 | 7.5 | 6.8 | 6 | 5.25 | 4.5 | 3 |
| Calcium (Ca) | 13.5 | 12.75 | 12 | 11.25 | 10.5 | 9.75 | 9 | 8.25 | 7.5 | 6.8 | 6 | 5.25 | 4.5 | 3 |
| Copper (Cu) | 0.09 | 0.09 | 0.08 | 0.08 | 0.07 | 0.07 | 0.06 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 | 0.03 | 0 |
| Manganese (Mn) | 0.11 | 0.1 | 0.1 | 0.09 | 0.08 | 0.08 | 0.07 | 0.07 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 | 0 |
| Zinc (Zn) | 0.09 | 0.09 | 0.08 | 0.08 | 0.07 | 0.07 | 0.06 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 | 0.03 | 0 |
| Boron (B) | 0.11 | 0.1 | 0.1 | 0.09 | 0.08 | 0.08 | 0.07 | 0.07 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 | 0 |
| Iron (Fe) | 0.9 | 0.85 | 0.8 | 0.75 | 0.7 | 0.65 | 0.6 | 0.55 | 0.5 | 0.45 | 0.4 | 0.35 | 0.3 | 0 |

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| SOYBEAN NUTRIENT REMOVAL - STOVER ONLY (LBS) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bushels/Acre | 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 2 |
| Nitrogen (N) | 99 | 93.5 | 88 | 82.5 | 77 | 71.5 | 66 | 60.5 | 55 | 49.5 | 44 | 38.5 | 33 | 2 |
| Phosphate (P2O5) | 21.6 | 20.4 | 19.2 | 18 | 16.8 | 15.6 | 14.4 | 13.2 | 12 | 10.8 | 9.6 | 8.4 | 7.2 | 6 |
| Potassium (K2O) | 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 2 |
| Sulfur (S) | 15.3 | 14.45 | 13.6 | 12.75 | 11.9 | 11.05 | 10.2 | 9.35 | 8.5 | 7.65 | 6.8 | 5.95 | 5.1 | 4 |
| Magnesium (Mg) | 32.4 | 30.6 | 28.8 | 27 | 25.2 | 23.4 | 21.6 | 19.8 | 18 | 16.2 | 14.4 | 12.6 | 10.8 | 9 |
| Calcium (Ca) | 72 | 68 | 64 | 60 | 56 | 52 | 48.0 | 44 | 40 | 36.0 | 32 | 28 | 24 | 2 |
| Copper (Cu) | 0.05 | 0.05 | 0.05 | 0.05 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0 |
| Manganese (Mn) | 0.79 | 0.75 | 0.70 | 0.66 | 0.62 | 0.57 | 0.53 | 0.48 | 0.44 | 0.40 | 0.35 | 0.31 | 0.26 | 0 |
| Zinc (Zn) | 0.47 | 0.44 | 0.42 | 0.39 | 0.36 | 0.34 | 0.31 | 0.29 | 0.26 | 0.23 | 0.21 | 0.18 | 0.16 | 0 |
| Boron (B) | 0.52 | 0.49 | 0.46 | 0.44 | 0.41 | 0.38 | 0.35 | 0.32 | 0.29 | 0.26 | 0.23 | 0.20 | 0.17 | 0 |
| Iron (Fe) | 1.80 | 1.70 | 1.60 | 1.50 | 1.40 | 1.30 | 1.20 | 1.10 | 1 | 0.90 | 0.80 | 0.70 | 0.60 | 0 |

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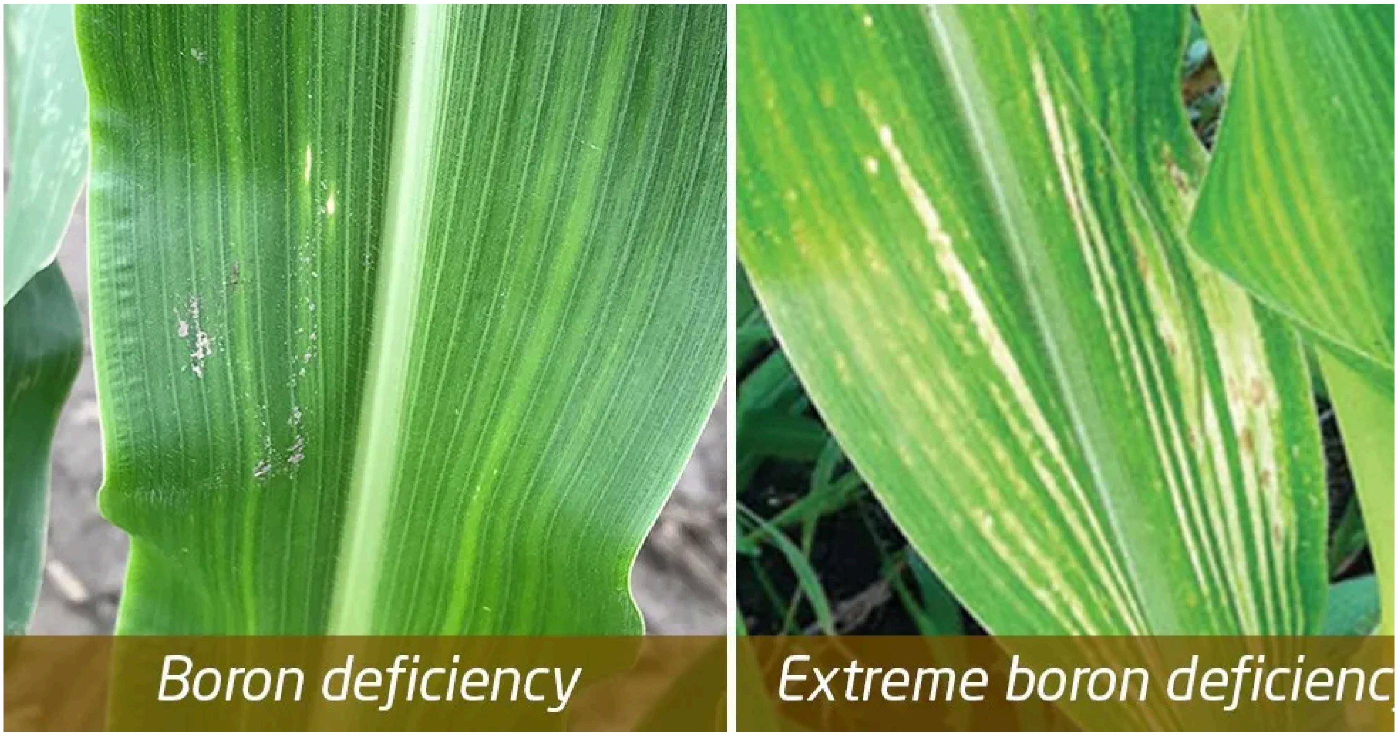
# Deficiency Symptoms

## - Corn

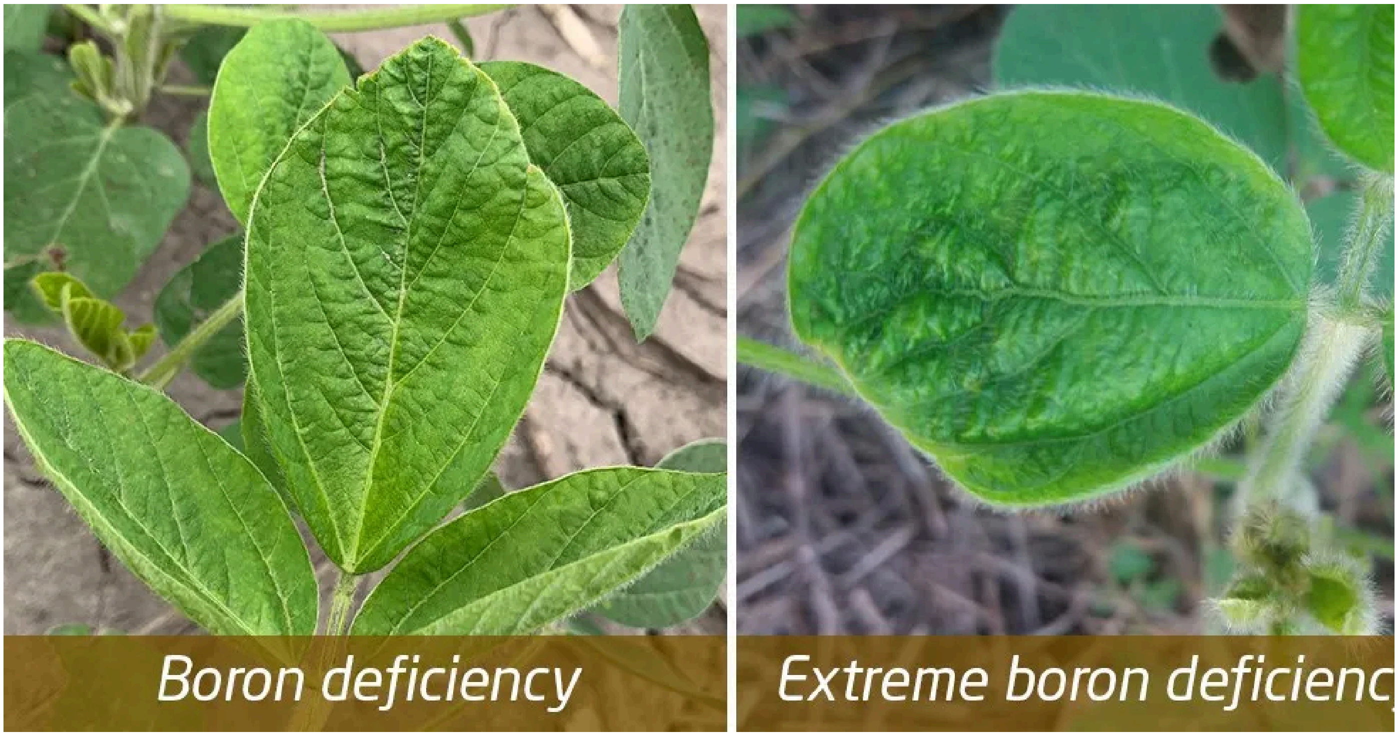
Since boron is immobile **within** the plant, deficiency symptoms first appear new growth and reproductive structures. The most notable sign is poor ear development, with missing or aborted kernels, resulting in a "zippered" cob appearance. In severe cases, tassels and ear shoots may be stunted or fail t emerge.

Vegetative symptoms include yellow (*similar to sulfur*) or white streaks between veins on young leaves, which can later merge into pale, waxy strea Leaves may become brittle with curled tips, and plants may be stunted wit shortened internodes. Affected corn plants often appear healthy early in th season but later develop poor kernel set. Boron deficiency is most likely in sandy, drought-prone, or high-pH soils. In these cases, early identification and correction are crucial to preventing yield losses.




## - Soybeans

Symptoms appear in new growth, with stunted plants, shortened internode and clustered nodes near the top. New leaves may be thick, leathery, and misshapen, with yellowing between veins. A key symptom is the death of th terminal growing point, which halts vertical growth and causes plants to ta on a bushy appearance.




Reproductive development is significantly impacted, with flowering stoppi
and few pods forming, leading to near-total yield loss in severe cases.
Symptoms can sometimes be mistaken for herbicide damage, making tissu
testing essential for accurate diagnosis. Boron deficiencies in soybeans are
most likely to occur in sandy, low-organic-matter soils, particularly in
drought conditions or high-pH environments. Preventive fertilization may
necessary in at-risk fields to avoid severe yield losses.

## How Do I Plan For Boron?

Now that we understand what Boron does for the plant, we know the requi
soil test levels/removal rates, and we can recognize when we have deficien
We need to now pivot on how to plan for Boron.

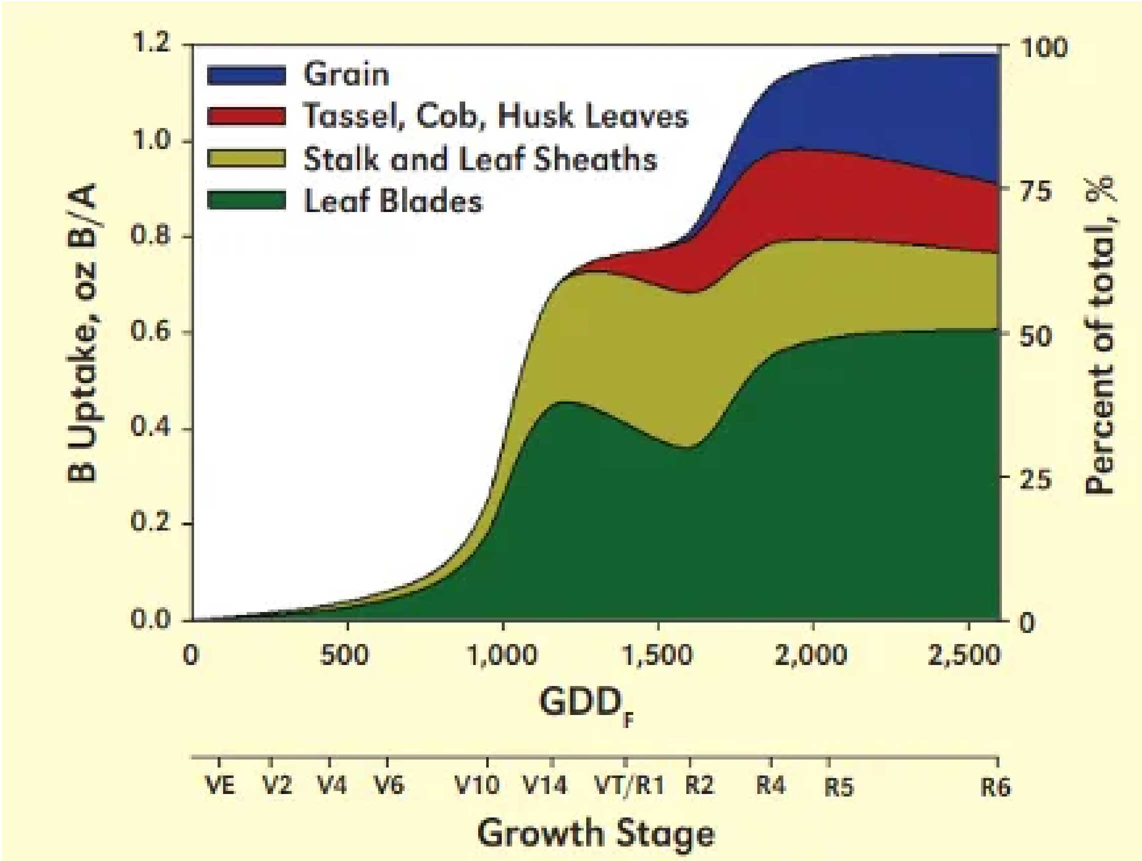
There are two primary way's to get Boron to the crop.

1. Soil Applications:

    a. Dry Granular Product
        i. Granubor or other 15% Boron Material
    b. Water Soluble Pre-emergence
        i. Solubor
2. Foliar Applications - .15 - .25 lbs of actual boron per application.
    a. 10% Boron
        i. 1 pt to 1 qt/acre
    b. 5% Boron
        i. 1 qt to 2 qt/acre
    c. Solubor
        i. 1.25 lbs/acre

When selecting your Boron source and application rate, remember that Bo is highly mobile within the soil profile. This mobility means sandy or low-organic-matter soils frequently show yield improvements after Boron applications, as these soils naturally lack adequate levels. Similar to managi nitrogen or sulfur, Boron must be applied proactively throughout the growi cycle to ensure sufficient availability for the crop. While Boron readily mov through the soil with water, it does not translocate within plant tissues; thu foliar-applied Boron can only be absorbed directly by the leaves it contacts

Look at the graphic below as it relates to Boron uptake by the plant.




Similar to other nutrients, the majority of Boron uptake occurs after the V1
growth stage (highlighting the similarity between Boron and nitrogen).
Consider timing your applications accordingly. In-season foliar application
offer immediate benefits, particularly products formulated with Boric Acid
(most 5% or 10% Boron products), as this is the form readily absorbed and
utilized by plants through leaf tissue.

## Boron Toxicity - Watchout:

Although Boron is essential, caution must be taken to avoid over-applicatio
as excessive Boron can quickly become toxic to crops, particularly soybean
which are highly sensitive. Over-application symptoms typically include lea
burn, necrotic spots on foliage, root damage, and inhibited growth, ultimat
reducing yield potential rather than enhancing it.

- Things to consider:
  - Foliar applications in excess of .25 lbs of actual boron should be consulted with product supplier or agronomist.
    - 1 pt of 10% boron provides .14 lbs of Boron
  - In-furrow starter products containing boron need to be used at low inclusion ratios.
  - Continuous application of pre-emergence high load liquid boron or over application of dry boron can lead to toxicity.

Careful monitoring, accurate testing, and precise application timing help ensure crops receive adequate Boron without risking the detrimental effect associated with excess levels.

## Closing

Understanding the critical role Boron plays in crop production and proactively managing its application can significantly influence your farm's productivity and profitability. Given its high mobility in the soil and immobility within plant tissues, effective Boron management requires thoughtful planning and precise timing. Incorporating Boron through eithe soil or foliar applications—especially during critical growth stages after V10 can substantially improve plant health, reproductive success, and overall yi potential. By recognizing and addressing Boron deficiencies early, growers can ensure their crops remain robust and productive throughout the seaso Investing in proper Boron nutrition today will lead to stronger, healthier plants and more consistent, profitable yields tomorrow.

## Other Information:

[AgPHD - Boron Video]

[US Borax Website]

[Boron Article]

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