



Knowledge grows



YaraLiva[®] Calcium Nitrate Fertilizer for Potato Production

YaraLiva CN-9 (9-0-0-11Ca) is an excellent source of nitrate nitrogen and water-soluble calcium for potato production.

With predictable nitrogen and plant-available calcium, YaraLiva is perfectly paired for optimal plant nutrition, which improves plant uptake of potassium, calcium, and magnesium.

Benefits

- Greater marketable yield and tuber quality
- Enhanced storage quality
- Improved crop resilience to environmental stresses during the growing season
- Increased nitrogen use efficiency
- Reduced greenhouse gas emissions associated with fertilizer production

Impact of YaraLiva CN-9 on Potato Yield and Quality: North American Field Trials

Yield Increase

Potato yields were increased by an average of 19.6 cwt/ac (73%) with YaraLiva CN-9 in 21 field trials conducted in North Dakota, Minnesota, Michigan, and Oregon between 2018 and 2021 (Figure 1).

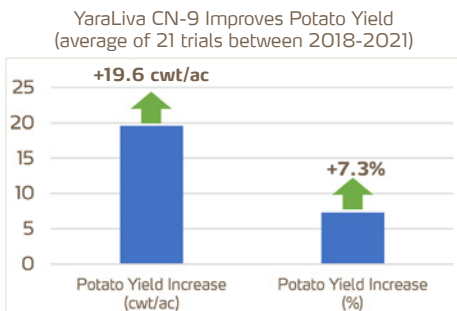
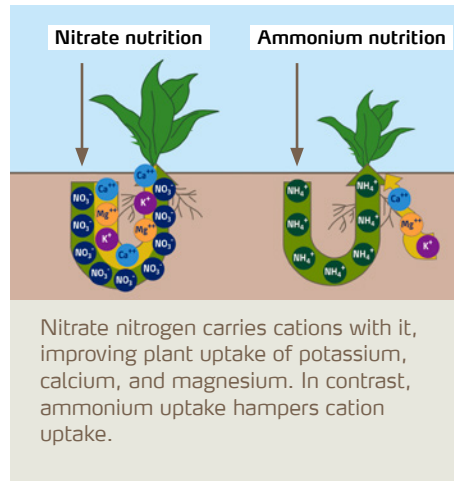


Figure 1. Average potato yield increase with YaraLiva CN-9 across 21 trials between 2018-2021

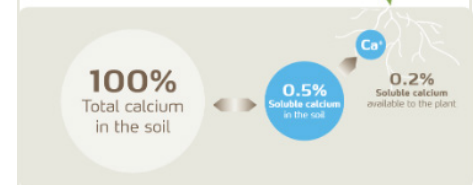


Importance of Calcium

Adequate calcium, a key component of strong cell walls, is essential in potato production. Providing available calcium to the potato crop leads to increased marketable yield and improved tuber quality, skin finish, and storability. Calcium also aids in plant health and stress resilience.

As much as 99.5% of the calcium in the soil is not available to the plant

Only **soluble calcium** is available to the plant



Form of Calcium Matters

Calcium exclusively enters tubers through the tuber and stolon roots, not through the plant's main root system. Only soluble calcium is available for plant uptake and uptake into the rapidly growing tubers. Fertilization with YaraLiva CN-9 "bathes" the tuber and stolon roots with water-soluble calcium, allowing calcium to be taken up into the tuber.

Importance of Calcium

Evaluation of calcium sources in Michigan showed YaraLiva CN-9 improved potato yields compared to calcium chloride (+14.5 cwt/ac), gypsum (+14.5 cwt/ac), and where no calcium was applied (+95 cwt/ac) (Figure 2). These findings are based on six field trials conducted between 2021-2023 on Manistee and Russet Norkotah varieties.

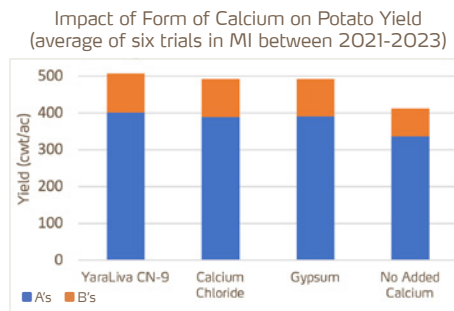


Figure 2. Impact of form of calcium on potato yield in Michigan across six trials between 2021-2023

Tuber Quality, Storability, and Return on Investment

Yara's Columbia Basin Potato Incubator Farm included three split pivots of Clearwater potatoes for two growing seasons (2022 and 2023). The Yara TopPotato program implemented on this farm included YaraLiva CN-9 and UCANI17 (65% YaraLiva CN-9 and 35% UAN32) as well as a YaraVita foliar crop nutrition program (see QR code on reverse for full description of our findings on the farm). Implementation of a full Yara crop nutrition program led to an increase in usable potatoes and decreased culls at harvest. Tuber quality out of storage was improved. Yara's TopPotato solution led to 458 more tons of usable potatoes and an average return on investment of \$139/acre versus the grower standard.

Storage Quality	Farmer Prosperity
<p>% usable +4%</p> <p>% culls -27%</p> <p>% 6 oz +5.3%</p> <p>Improved storage quality led to 458 tons more usable potatoes across three fields.</p>	<p>Positive ROI in 100% of fields</p> <p>+\$139/ac average net return</p>

YaraLiva CN-9 Contributes to the Sustainable Potato Acre

YaraLiva CN-9 is made up of fast-acting, predictable nitrate nitrogen. It can be used alone or in combination with UAN (32-0-0) to create UCAN. Spoon-feeding YaraLiva CN-9 and UCAN through the pivot to meet in-season crop nitrogen and calcium demand is highly efficient.

- UCAN-17 (17-0-0-7.2Ca) has 49% nitrate-nitrogen, 19% ammoniacal-nitrogen, and 32% urea-nitrogen. Since nitrate nitrogen is immediately available for uptake – using a nitrogen source high in nitrate-nitrogen allows for predictable uptake.
- Additionally, UCAN-17 is recognized as a high efficiency fertilizer. In certain environments, urea nitrogen is susceptible to ammonia volatilization. The calcium in UCAN17 reacts with the urea fraction of UAN to reduce volatility.

Nitrogen Use Efficiency Using YaraLiva CN-9 and UCAN in Potato Production

By applying predictable and available sources of nitrogen fertilizer at the right time and rate, it is possible to improve nitrogen use efficiency. Trials in Washington and Idaho have demonstrated between 6% to 11% increase in nitrogen use efficiency when using a UCAN17 and YaraLiva CN-9 program compared to a urea or UAN program (Figures 3-5).

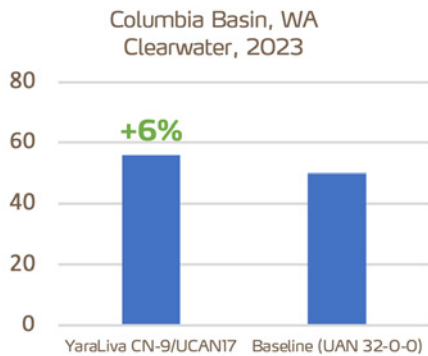


Figure 3. Nitrogen use efficiency in Clearwater potatoes grown with YaraLiva CN-9 and UCAN17 compared to UAN32 (Columbia Basin, WA - 2023)

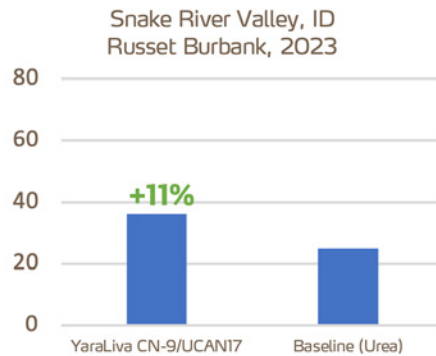


Figure 4. Nitrogen use efficiency in Russet Burbank potatoes grown with YaraLiva CN-9 and UCAN17 compared to urea (Snake River Valley, ID - 2023)

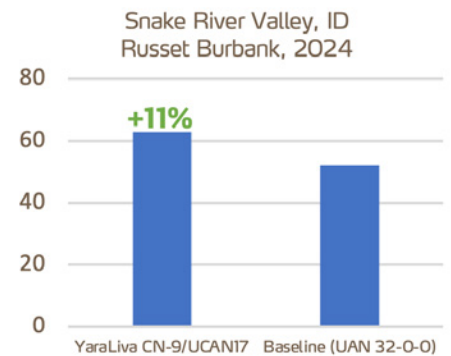


Figure 5. Nitrogen use efficiency in Russet Burbank potatoes grown with YaraLiva CN-9 and UCAN17 compared to UAN32 (Snake River Valley, ID - 2024)

Impact of YaraLiva CN-9 and UCAN on in-field Greenhouse Gas Emissions

At Yara, our ambition to grow a Nature-Positive Food Future is centered on regenerative farming, climate neutrality, and supporting farmer prosperity. Yara's focus is on decarbonizing the food chain through the production and supply of low emission fertilizers.

Yara is a global leader in manufacturing low carbon footprint (CFP) nitrogen fertilizers. Yara's nitrate-based fertilizers produced in the EU + Norway have a significantly lower CFP than most non-EU fertilizers. Yara's use of a N₂O abatement catalyst coupled with energy efficiency improvements at the factory significantly reduce the manufacture emissions of Yara's nitrate-nitrogen fertilizers.

Yara TopPotato Program Reduces Emissions on the Potato Acre

Yara Columbia Basin Potato Incubator Farm, 2023

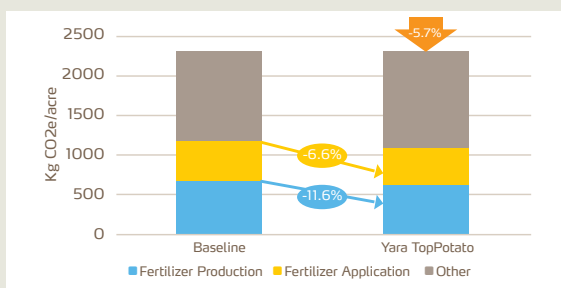


Figure 6. Greenhouse gas emissions per acre on Clearwater potato field using Yara nitrogen fertilizer program (YaraLiva CN-9 and UCAN17) compared to baseline fertilizer program (UAN32) in Columbia Basin of Washington (2023). Greenhouse gas emissions estimated using Cool Farm Tool Version 2.31.0.

Reductions in greenhouse gas emissions resulted from:

- Replacing 20% of the grower standard nitrogen source (32-0-0 UAN manufactured in North America) with Yara's nitrogen fertilizer manufactured with a low carbon footprint, YaraLiva CN-9.
- Improving nitrogen use efficiency by 6% (Figure 3).

The implementation of a full Yara TopPotato crop nutrition program including, YaraLiva CN-9 and UCAN17, on Clearwater potatoes grown on Yara's Columbia Basin Potato Incubator Farm in 2023 led to reduced greenhouse gas emissions on the potato acre (-5.7% kg CO₂e/acre) (Figure 6).

To learn more about Yara's nitrogen solutions for potato production in your region, scan the QR code:



To learn more about Yara's Columbia Basin Incubator Farm Results, scan the QR code:

