

# Yields Improve In Irrigated Alfalfa Using NPK Fluids

*Improvements of yields were impressive with both 3-18-18 and 6-24-6.*

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**Summary:** Yield improvements were impressive with 6-24-6, providing over a 3 ton (@65 percent moisture) improvement over the grower standard practice of 20.5 tons, compared to 23.3. Improvements with these types of applications for both years have encouraged the Cooperating Farm Managers to incorporate these applications into many of the alfalfa fields for the future.



**A**lfalfa continues to be the world class leader for feed value for North American production agriculture. This is especially true for areas within the intermountain West. Acre numbers, while not at historical highs, are still high enough to make these areas either the number 1 or 2 largest cropping sites in each of these states. Forages, including alfalfa, are enjoying some of the greatest economic returns that have been observed for many years.

A lot of this is related to changes in population in these areas, diets of international customers, and markets. There continues to be a growth in dairy markets with larger and larger dairy operations at feed yards.

All of these contributing factors have pushed the price of alfalfa well beyond expectations from just a few years ago. These changes are bound to get the attention of producers and prompt more questions regarding increased production strategies.

The Fluid Fertilizer Foundation continues to have an interest in developing a better understanding of how to more effectively improve nutrient use efficiency (NUE) with the applications of two salt fluids.

## Proper nutrition

Yield of all crops, including alfalfa, will always be dependent on amount and quality of irrigation water in the desert areas of this geography.

However, proper nutrition related to available fertility becomes of primary importance. This is especially true for phosphorus (P) use as growers push for high yields and high relative feed value, while also being conscientious about environmental constraints. As Dr. Glenn Shewmaker, Extension Forage Specialist and Professor at the University of Idaho, says, "Phosphorus is the most common fertilizer input for alfalfa across the Western U.S. It is essential for optimum alfalfa production and quality, but may also create concerns for the environment."

Potassium (K) is also a nutrient that is heavily used by rapid-growing alfalfa and in many growing conditions needs to be managed similar to P fertilizer. In the author's experience, if P and K are both limiting, P should be applied first to resolve the issue and then apply K. In many production fields, although P and K may test adequately in the soil, there may very well be factors that limit the availability to access these primary nutrients in a timely manner to maximize yield and improve alfalfa quality.

## Objective

This unique study explores the potential of addressing in-season application of low salt fluid NPK delivered to alfalfa at the right time within a growing season and between cuttings. Many farmers and researchers focus only on dosage or rate of nutrients applied when other parts of

nutrient management criteria should also be explored: namely, timing and form of nutrient delivery.

## Foliar applications

Foliar applications of low salt NPK fertilizers were applied to established irrigated alfalfa during the 2012, 2013, and into the 2014 growing season. Applications were made when the regrowth was about 6 to 8 inches tall. In 2012, applications were made with a commercial sprayer and made between the 2nd and 3rd cuttings. The NPK fluid applications at that time were 3-18-18. Rates of application included a total of 0, 2.5 or 5.0 gallons per acre for each cutting.

Irrigation was allowed to be stopped for 24 hours to assure adequate drying on the foliage of the alfalfa. Each treatment was laid out with anticipation of harvest and determining yields.

## Changes made

Applications of foliar nutrients applied in season increased yields during the 2012 season for each of the cuttings. These yield improvements were able to deliver an economic improvement for the forage being used. Kent Frisch, who is the Farm Manager for this area for Simplot, said, "It looks as if these applications are something we should be pursuing. However, the system needs changing for ease of applications." Therefore, changes were made in 2013 and 2014 to address farmer concerns.



Trials for the in-season applications were expanded to three pivots.

Each pivot covered 120 acres and included treatments of 3-18-18 applied by aircraft. Applications of 6-24-6 were through center pivots and each was compared to the grower standard practice (GSP) where no additional

nutrients were applied.

Liquid NPK's were applied when the crop had a regrowth of 6 to 8 inches. Rates included 3, 5, and 5 gallons per acre for each of the respective cuttings.

Each pivot was harvested with commercial swathers. Trucks were weighed with hay quality samples

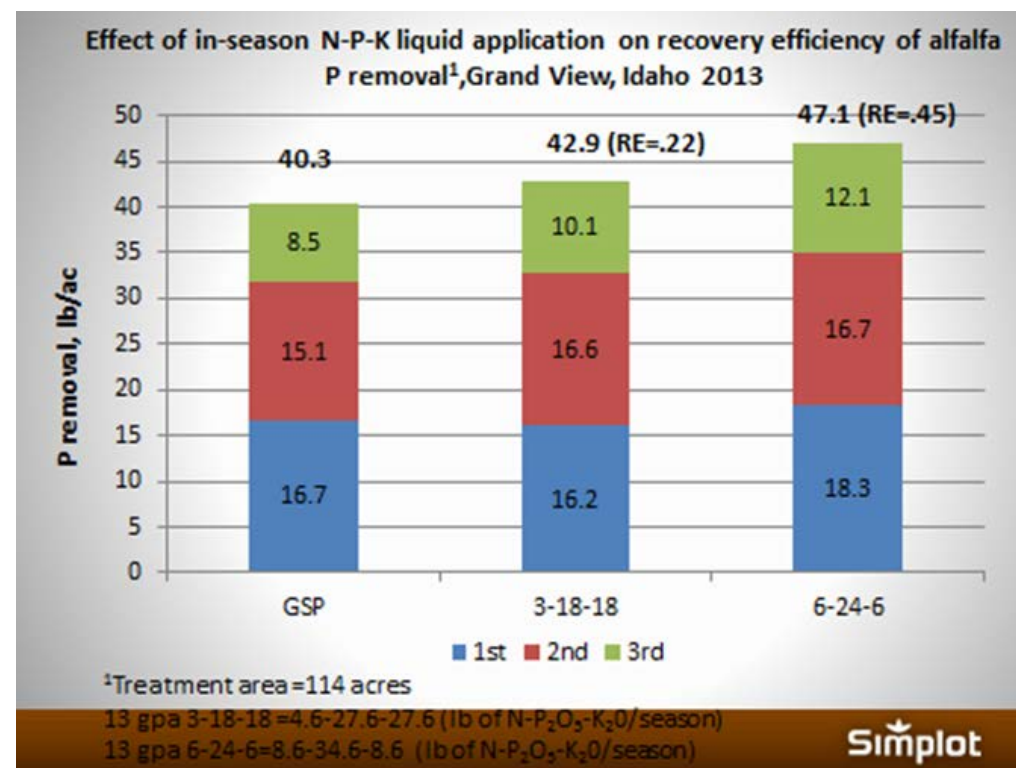


Figure 1. Phosphorus recovery from in-season applications of NPK fluid fertilizer to irrigated alfalfa.

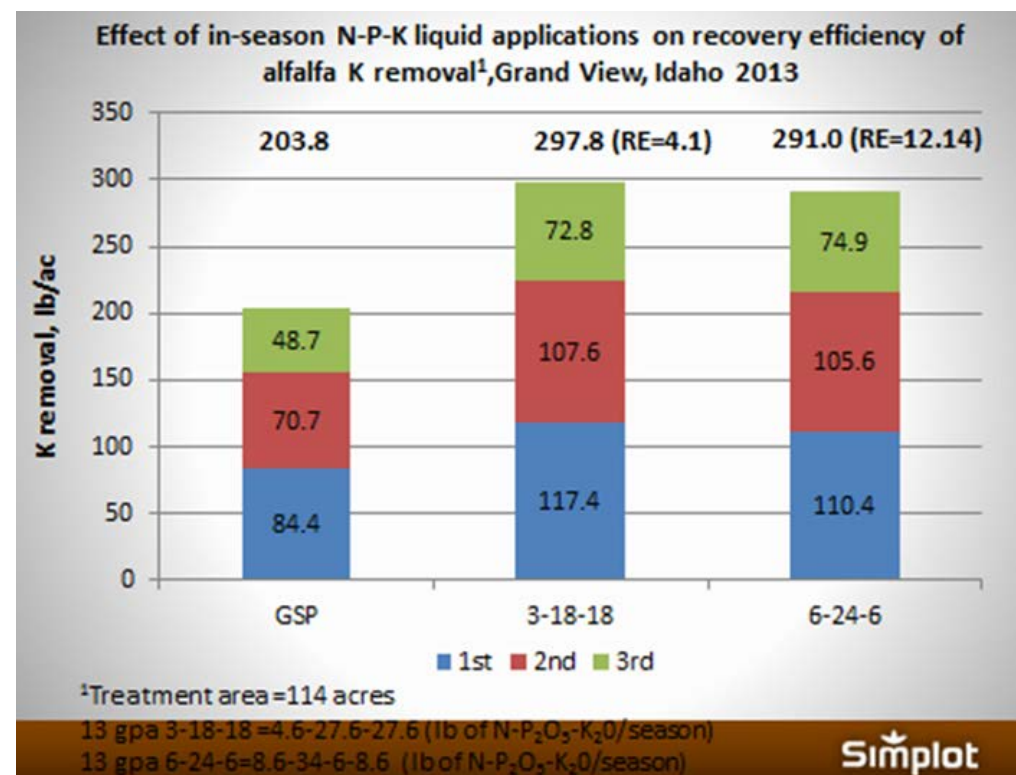


Figure 2. Potassium uptake and recovery from in-season applications of NPK fluid fertilizer to irrigated alfalfa.

removed for quality analysis. In total there were about 600 trucks weighed and sampled, providing a very good evaluation of treatment responses.

The main objective of the Simplot alfalfa is for it to be used as livestock feed. All was green-chopped with a moisture content of 65 percent. The 2013 trials indicated a very positive response to in-season NPK applications.

Improvements in nutrient content of P and K were both remarkable (Figures 1 and 2). It is interesting to note the changes in tissue concentration and removal from relatively low applications for both P and K.

Three times as much removal of these nutrients was observed compared to the application totals.

While not shown in this article, there was an improvement in relative forage quality and it could be attributed directly to increased nutrient uptake as a result of these in-season low salt NPK fluid fertilizers being applied.

#### Yields up

Yield improvements were positive for both the 3-18-18 and the 6-24-6. However, the applications applied through the center pivot tended to be higher. Improvements of yields were impressive with 6-24-6 providing over a 3 ton (@ 65% moisture) improvement over the grower standard practice of 20.5 tons compared to 23.3. Improvements with these types of applications for both years have encouraged the Cooperating Farm Managers to incorporate these applications into many of their alfalfa fields for the future.

Observes Kent Frisch: "If we can consistently see these types of responses and the materials can improve our alfalfa production benefits-to-cost by at least 2:1, our alfalfa production will be seeing more of these applications."

#### Our goals

The J.R. Simplot Company continues to improve on nutrient management as it applies to both new products as well as a better understanding of how to use the nutrients we have. It should also be noted that improvements in Relative Feed Quality were also positively influenced and especially with the 3-18-18 applications. This may have been related to the higher concentration of tissue K that resulted from this particular NPK low-salt foliar application. The positive nature

of improvements to alfalfa production with in-season applications of NPK fluids is a great example of addressing the current needs for growers and crop advisors.

#### Looking ahead

It should be noted that because of this very involved set of data conducted on these large fields and the positive measurable response (to meet the 2:1 economic returns) that almost 8,000 acres of alfalfa being irrigated by center pivot are currently receiving similar in-season applications of 6-24-6 being injected through pivots. We will also continue applications and measurements through 2014.

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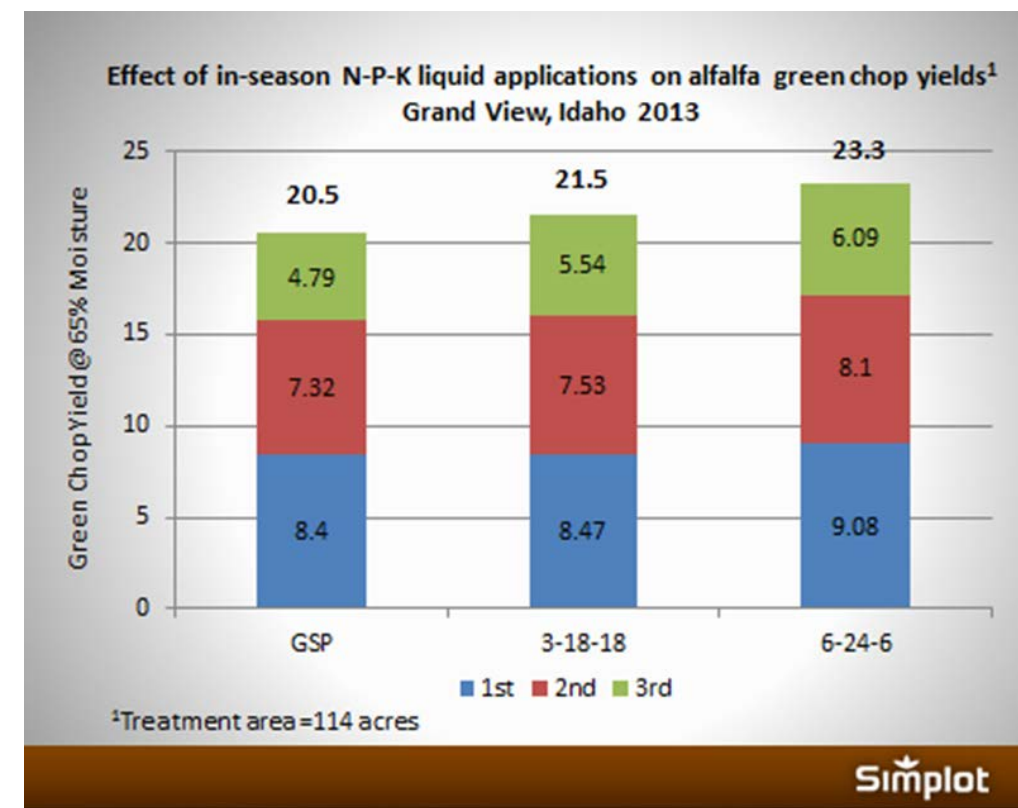


Figure 3. Yield improvements with application of liquid NPK to established alfalfa (65% moisture) GSP (grower standard practice)

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- *the agronomics of fluid fertilizer in the production of maximum economic crop yields*
- *application techniques for fluid fertilizers*
- *the efficiencies and conveniences of fluid fertilizer systems*
- *methods of controlling environmental problems with fluids.*



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