



REPLICATED FIELD TRIAL · AGRICENTER INTERNATIONAL, MEMPHIS TN

Feeding alfalfa at seeding

Four spray-applied nutrition programs, four replications, one season — and what a calcium-and-nitrogen foundation did to a first-year stand. Measured, not estimated.

+117%

more harvested weight
than the untreated check

4

replications in
randomised blocks

P=0.0016

treatment effect on
harvested weight

TRIAL ID
2022 AgriTec Alfalfa

PLANTED
26 May 2022

CROP
Medicago sativa · alfalfa

DESIGN
RCB · 5 treatments · 20 plots



Every program beat doing nothing

Every treated program out-yielded the untreated check on harvested weight, and the difference was large enough that statistics, not optimism, carried it. The best program returned **6.18 lb per plot against 2.85 lb where nothing was applied** — a 117% increase on a first-year stand.

6.18

lb/plot, best program
Program 3 · split potassium

2.85

lb/plot, untreated
no fertility applied

+117%

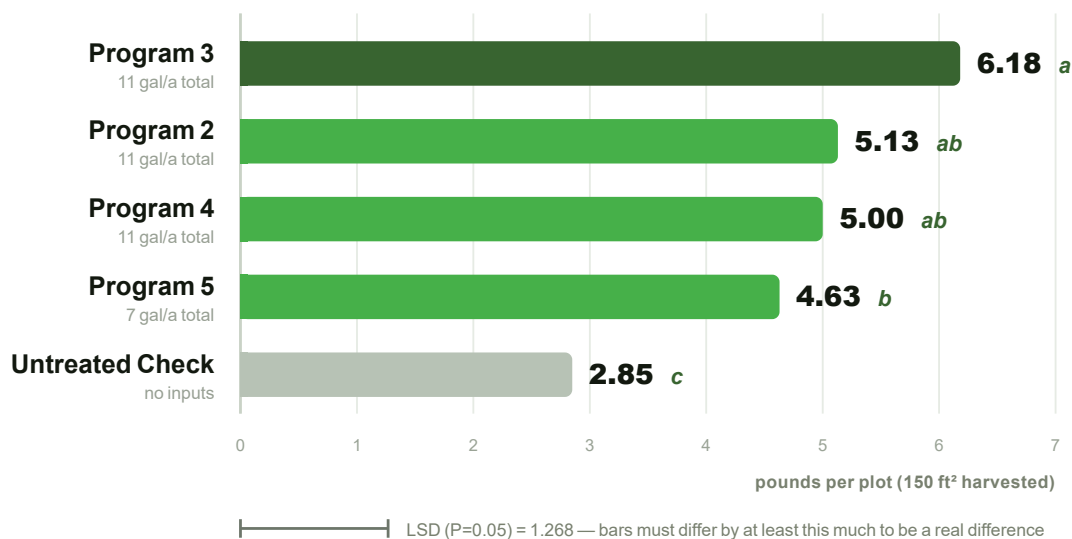
harvested weight gain
Program 3 over the check

1.27

LSD at P=0.05
the bar a difference must clear

Harvested weight by program

Mean of 4 replications, cut 22 August 2022 · 88 days after the first application. Letters mark statistical grouping: programs sharing a letter did not differ significantly at P=0.05.



Read this honestly

Programs 2, 3 and 4 all beat the check, but they did **not** separate from each other — they share the letter “a” or “ab”. The defensible claim from this trial is that feeding the stand beat not feeding it. Choosing between the three feed programs is an agronomic and cost decision, not one this data settles.

The same result, per acre

Plot weights converted on the 150 ft² harvested area (×290.4). A single cut in the seeding year — not a full-season yield.

828

lb/acre · untreated check

**1,795**

lb/acre · Program 3

a gain of

967 lb

per acre · about 0.48 ton



The four programs tested

All four programs were spray-applied in water at 15 gal/acre through a CO₂ backpack with 8002 flat-fan nozzles. Application A went out **at planting on 26 May**; Application B went out **at V6 on 22 June**. Programs 2–4 carried the same total volume (11 gal/a), so the comparison between them is about timing and analysis, not rate.

CHECK Untreated Check	PROGRAM 2 Full rate, all up front	PROGRAM 3 Split potassium	PROGRAM 4 Split with phosphate	PROGRAM 5 No calcium, no Nitromaxx
No fertility applied. The baseline every other program is measured against.	Calcium 2 gal/a AT PLANTING Nitromaxx 2 gal/a AT PLANTING 0-0-30 7 gal/a AT PLANTING	Calcium 2 gal/a AT PLANTING Nitromaxx 2 gal/a AT PLANTING 0-0-30 4 gal/a AT PLANTING 0-0-30 3 gal/a AT V6	Calcium 2 gal/a AT PLANTING Nitromaxx 2 gal/a AT PLANTING 3-18-18 4 gal/a AT PLANTING 0-0-30 3 gal/a AT V6	0-0-30 3 gal/a AT PLANTING 3-18-18 4 gal/a AT PLANTING
2.85 lb/plot harvested	11 gal/a · 5.13 lb/plot	11 gal/a · 6.18 lb/plot	11 gal/a · 5.00 lb/plot	7 gal/a · 4.63 lb/plot

What each product was doing

Calcium

Applied at planting in every calcium program. Calcium moves with water and does not translocate once placed, so it goes down where the new root will grow rather than being fed later.

Nitromaxx

The nitrogen source at seeding. A new alfalfa stand has no functioning nodules for its first several weeks — it cannot fix its own nitrogen until rhizobia colonise, so early N is doing real work.

0-0-30

Potassium. Alfalfa is a heavy potassium user and this soil tested at CEC 7.8 — a light silt loam with limited holding capacity, which is exactly where a split application is worth testing.

3-18-18

Phosphate and potash together, substituted for part of the potassium in Program 4 to put early phosphate in front of a young root system.

One confound worth naming

Program 5 carried no calcium and no Nitromaxx — but it also carried **7 gal/a instead of 11**. Its lower result is consistent with the calcium-plus-nitrogen foundation mattering, but this trial cannot separate that from the lower total volume. Treat it as a signal worth testing further, not as proof.

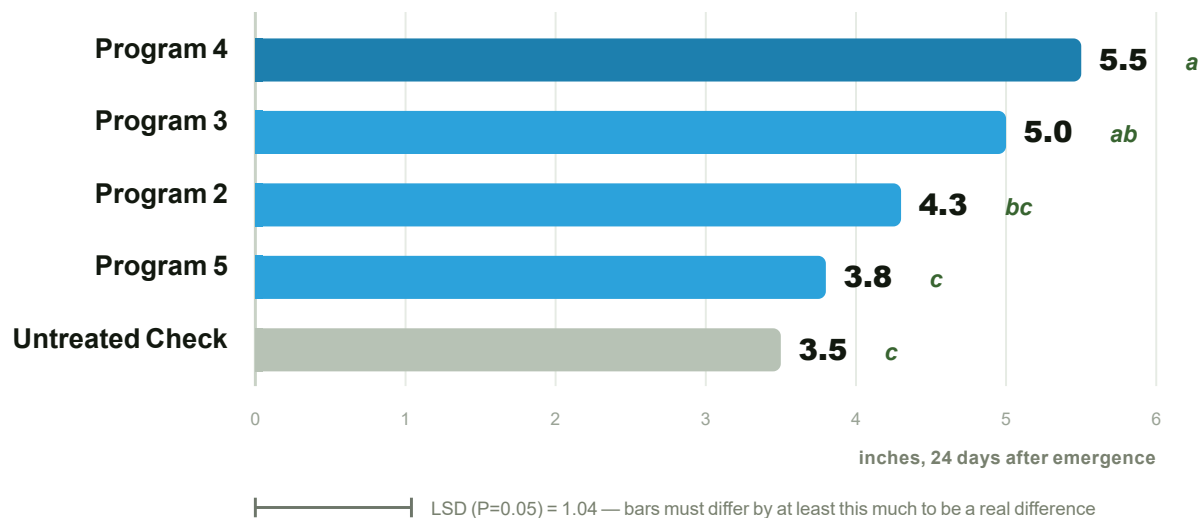


Where the differences were real

Two of the four assessments showed a statistically significant treatment effect: plant height in late June, and harvested weight in August. Both put the calcium-plus-nitrogen programs ahead of the check.

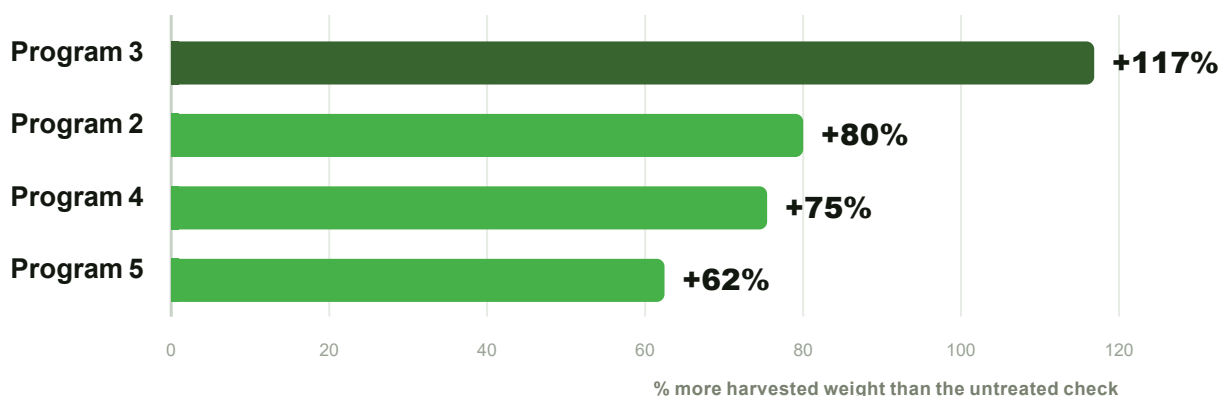
Plant height SIGNIFICANT • P=0.0062

Measured 27 June • 24 days after emergence, 5 days after the V6 application. Mean of 4 replications.



Gain over the untreated check

Harvested weight expressed as percent above the 2.85 lb/plot check mean.



Height and weight do not rank the same way

Program 4 was tallest at 24 days; Program 3 was heaviest at harvest. Early height says a young stand is establishing, but it is not biomass and should not be read as an early yield prediction. Where the two agree is the part worth trusting: **every calcium-plus-nitrogen program cleared the untreated check on both.**

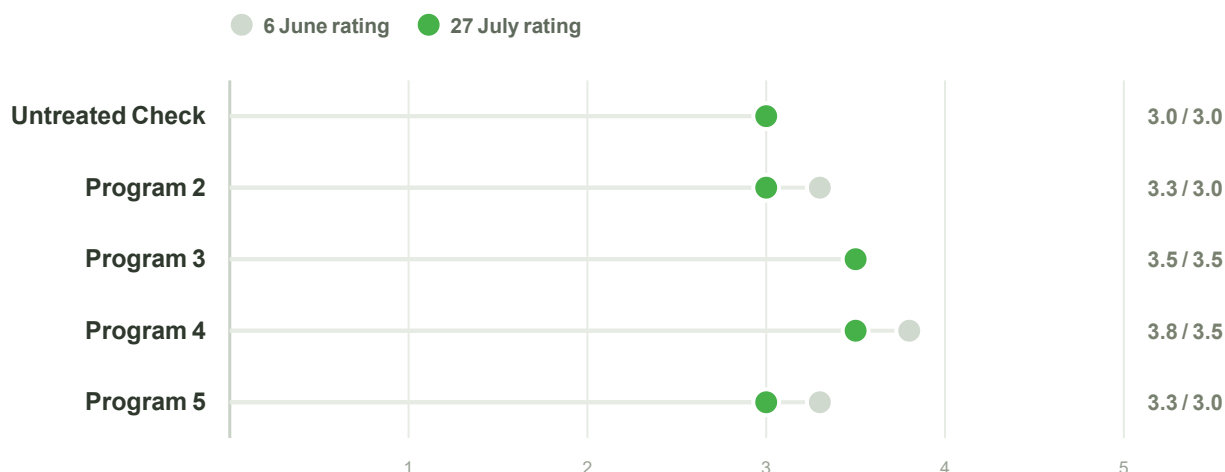


What the trial did not show

The two stand-quality ratings did not reach significance. They are reported here as measured rather than quietly dropped — a trial is only worth what its weakest reported number is honest about.

Stand quality index NOT SIGNIFICANT

1–5 visual index, mean of 4 replications. The June rating returned $P=0.279$. The July rating returned $P=0.0625$ and its residuals failed both the normality and equal-variance checks, because nearly every plot scored the same. Neither rating supports a treatment claim.



All four ratings, side by side

Treatment	Quality 6 Jun · 1–5	Height 27 Jun · in	Quality 27 Jul · 1–5	Weight 22 Aug · lb/plot	Weight lb/acre	Gain vs check
Untreated Check	3.0	3.5 ^c	3.0	2.85 ^c	828	—
Program 2	3.3	4.3 ^{bc}	3.0	5.13 ^{ab}	1,490	+80%
Program 3	3.5	5.0 ^{ab}	3.5	6.18 ^a	1,795	+117%
Program 4	3.8	5.5 ^a	3.5	5.00 ^{ab}	1,452	+75%
Program 5	3.3	3.8 ^c	3.0	4.63 ^b	1,345	+62%

Superscript letters apply within a column; means sharing a letter do not differ at $P=0.05$ by LSD. No letters are shown in the quality columns because the treatment F-test was not significant, so mean separation was not performed. The lb/acre column is a direct conversion of the 150 ft² harvested area ($\times 290.4$) from a single cut — not a measured whole-field yield.

Why a visual index went nowhere here

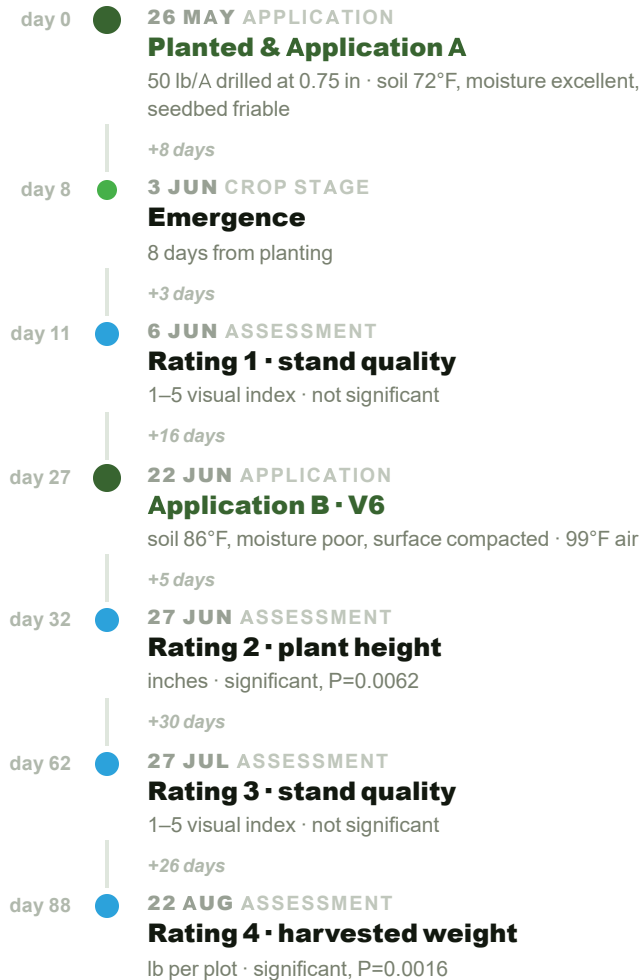
A 1–5 stand-quality score has five possible values and most plots landed on 3. That is not enough resolution to separate treatments that a scale reading in tenths of a pound separated easily. It is a limitation of the measurement, not evidence that the programs did nothing — the weight data from the same plots says otherwise.



How the season ran

The season is worth reading alongside the numbers. Application A went out into near-ideal conditions. Application B did not — and the split programs still finished at the top of the trial.

Season timeline



Conditions at each application

	Application A 26 May · at planting	Application B 22 Jun · V6
Air temperature	78 °F	99 °F
Relative humidity	42%	36%
Wind	3 mph, S	2 mph, S
Soil temperature	72 °F	86 °F
Soil moisture	Excellent	Poor
Soil surface	Friable	Compacted
Leaves wet	No	No
Days after emergence	–8	19

Why the second pass matters

By 22 June the plots were hot, dry and crusted — 99°F air, 86°F soil, poor moisture, a compacted surface. That is the kind of day a grower is tempted to skip.

The two programs that went out anyway (3 and 4) finished first and third on harvested weight, and first and second on height.

This trial was not designed to test skipping the second pass, so read that as an observation from the conditions log — not as a tested result.

Application equipment — identical for both passes

SPRAYER
CO₂ backpack

PRESSURE
30 PSI

NOZZLE
8002 flat fan

SPACING
20 in · 2 per row

BOOM
6 ft at 19 in

GROUND SPEED
3 mph

CARRIER
Water, 15 gal/ac

COVERAGE
100%



The ground it was grown on

This was a light silt loam with a modest cation exchange capacity and low organic matter — a soil that holds nutrients loosely. That is the context for why a split-applied potassium program was worth testing here.

Soil texture



Silt loam · Falaya / Waverly series

6.5

pH

In range for alfalfa (6.5–7.0)

7.8

CEC

Low holding capacity — nutrients leach

1.8%

Organic matter

Low; limited nutrient buffering

Good

Drainage

Falaya / Waverly series

What CEC 7.8 means in the field

Cation exchange capacity is the soil's ability to hold positively charged nutrients — calcium, potassium, magnesium — against leaching. At 7.8 this soil has room for one meal, not a pantry. Put a season's potassium down at once and a wet spell can move part of it past the root zone before the stand uses it.

That is the agronomic reason Programs 3 and 4 split their potassium, and it is the difference this trial was built to look at.

Planting & site

Location	Agricenter International, Memphis, Shelby Co., TN
Crop	Alfalfa · <i>Medicago sativa</i>
Planting date	26 May 2022
Seeding rate	50 lb/acre
Depth	0.75 in
Row spacing	7.5 in · 9 rows per plot
Equipment	Plot drilling machine
Seed bed	Friable
Tillage	Conventional-till
Emergence	3 June 2022 · 8 days after planting
Treated plot	10 × 30 ft · 300 ft ²
Harvested area	5 × 30 ft · 150 ft ²
Soil name	Falaya, Waverly · silt loam
Soil temperature at planting	72 °F
Soil moisture at planting	Excellent
Fertility level	Rated excellent at trial start

The check plots were not starved

Baseline fertility at this site was rated **excellent** and pH was already 6.5, which is inside alfalfa's preferred range. The untreated check was not a deficient soil being rescued — it was a reasonable seedbed that a grower would have been content to plant into. The response measured in this trial came on top of that, which makes it a harder test to pass, not an easier one. On a soil that started out short of calcium or potassium, the gap between fed and unfed would be expected to be wider still — but that is reasoning from agronomy, not something these plots measured.



Trial design & statistics

Field layout

Randomised complete block. Each treatment appears once in every replication, and the order is randomised within each block so a gradient across the field cannot be mistaken for a treatment effect.



Each plot 10 × 30 ft (300 ft²) · randomised complete block, 4 replications

■ Untreated Check ■ Program 2 ■ Program 3 ■ Program 4
■ Program 5

How to read the letters

Means followed by the same letter do not differ significantly at $P=0.05$ by LSD. A program marked a and one marked ab are *not* distinguishable — only a versus c is a real separation.

Mean comparison is performed only when the treatment F-test is significant. Where it was not, no letters are shown at all.

Least Significant Difference

On harvested weight the LSD was 1.27 lb/plot. Program 3 (6.18) beats the check (2.85) by 3.33 — well clear. It beats Program 4 (5.00) by 1.18, which does not clear the LSD. That is why they share a letter.

Analysis of variance — all four ratings

Rating	Grand mean	LSD P=0.05	Std. dev.	CV %	Treatment F	Treatment P(F)	Verdict
Quality index 6 Jun · 1–5	3.35	0.73	0.47	14.16	1.444	0.2790	NOT SIGNIFICANT
Plant height 27 Jun · in	4.40	1.04	0.68	15.39	6.164	0.0062	SIGNIFICANT
Quality index 27 Jul · 1–5	3.20	0.49	0.32	9.88	3.000	0.0625	ASSUMPTIONS FAILED
Harvested weight 22 Aug · lb/plot	4.755	1.268	0.823	17.31	8.652	0.0016	SIGNIFICANT

Limitations we are not going to paper over

- **One site, one season, one soil type.** Memphis silt loam, 2022. This has not been repeated across years or geographies.
- **The 27 July quality rating is unusable.** Levene's test and Shapiro-Wilk both failed ($P=0.0005$) because the scores were near-constant. No conclusion should be drawn from it.
- **The feed programs did not separate from each other.** Only the treated-versus-untreated contrast is statistically supported.
- **Weight was recorded as lb/plot at a single cut.** It is not a multi-cut season yield, and the per-acre figures are an area conversion.
- **Not conducted under GLP or GEP.** Independent site, standard ARM protocol, but not a regulatory study.



Plot-level data & next steps

Every plot, every rating

All 20 plots as recorded. Rep numbers correspond to the blocks on the field map.

Treatment	Plot	Rep	Qual 6 Jun	Height 27 Jun	Qual 27 Jul	Weight 22 Aug
Untreated Check	101	1	3.0	3.0	3.0	2.50
	205	2	3.0	4.0	3.0	3.00
	301	3	3.0	4.0	3.0	3.10
	404	4	3.0	3.0	3.0	2.80
Mean			3.0	3.5	3.0	2.85
Program 2	102	1	3.0	3.0	3.0	3.50
	201	2	4.0	4.0	3.0	6.30
	304	3	3.0	5.0	3.0	5.40
	402	4	3.0	5.0	3.0	5.30
Mean			3.3	4.3	3.0	5.13
Program 3	103	1	3.0	5.0	3.0	6.00
	202	2	4.0	6.0	4.0	5.20
	305	3	4.0	5.0	4.0	7.20
	403	4	3.0	4.0	3.0	6.30
Mean			3.5	5.0	3.5	6.18
Program 4	104	1	4.0	5.0	3.0	5.10
	203	2	4.0	5.0	4.0	4.30
	302	3	4.0	6.0	4.0	5.00
	405	4	3.0	6.0	3.0	5.60
Mean			3.8	5.5	3.5	5.00
Program 5	105	1	3.0	4.0	3.0	5.70
	204	2	3.0	4.0	3.0	4.00
	303	3	3.0	4.0	3.0	4.30
	401	4	4.0	3.0	3.0	4.50
Mean			3.3	3.8	3.0	4.63

Trial identification

TRIAL & PROTOCOL ID
2022 AgriTec Alfalfa

LOCATION
Agricenter International

TRIAL YEAR
2022 · field, established

STUDY DESIGN
RCB, 4 replications

TREATMENTS
5 · 20 plots

CLIMATE ZONE
EPPO South East

GLP / GEP
No / No

SOFTWARE
ARM 2023.0

Source: 2022 AgriTec International Alfalfa, conducted at Agricenter International, Memphis TN. Data as recorded in the ARM 2023.0 assessment summary and AOV means table. This document reformats that source for readability — no values were altered and no assessment was omitted.

What we would do next

- 1 Repeat across sites and years.** One season on one silt loam is a strong signal, not a proven program. The same five treatments on a heavier soil and a sandier one would tell us how much of this is soil-specific.
- 2 Separate the Program 5 confound.** Run a no-calcium treatment at the full 11 gal/a so volume and chemistry stop moving together.
- 3 Carry it through multiple cuttings.** Seeding-year response is the question this trial answered. Stand persistence and second- and third-year tonnage are the questions that decide the economics.
- 4 Add tissue tests at each rating.** Harvested weight tells us something worked. Tissue analysis would tell us which nutrient was actually limiting.
- 5 Replace the visual index with a measurement.** Stand counts per foot of row would give the establishment data the 1–5 score failed to resolve.



Put your own soil behind this

These numbers came off a silt loam at CEC 7.8 with 1.8% organic matter. Yours will differ. A soil test is where a program stops being someone else's trial and starts being a recommendation for your field.

Request a soil test · agritecint.com