

Dry Edible Bean Population and Inoculant Studies (Direct Harvest)

Crop Management Conference

Nebraska On-Farm Research Network

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In the past 10 years the direct harvest of dry edible beans has increased from 5% to 20 or 25% in the Nebraska Panhandle



On Farm Research Studies 2020

Population and Inoculant Studies using Direct Harvest





Population Studies

UNL Extension On-Farm Research



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Pinto Bean Planting Population for Direct Harvest, Angora (Morrill County) 2020

Pinto Bean Planting Population for Direct Harvest

Study ID:

County: Morrill

Soil Type: Sandy loam

Planting Date: 5/29/20

Harvest Date: 9/14/20 (Deere® S780 combine/ MacDon® FD-75 35' head.)

Row Spacing (in): 20" planted (John Deere MaxEmerge ,CCS Seed Delivery; 60 ft)

Variety: Vibrant

Reps: 4

Previous Crop: Corn

Tillage: No-till, rolled after planting

Herbicides: Pre:

5-27-2020: Warrant 1.25qt/ac

6-2-2020: Actamaster (AMS) Soluble Crystal Spray Adjuvant 2.50 lb/ac

Liberty 280 SL , 32.00 fl oz/ac

MSO Concentrate Methylated Seed Oil 1.44 pt/ac

Roundup PowerMAX 32.00 fl oz/ac

Post:

6-23-20 Medal EC 1.00 pt/ac

7-6-20: Actamaster (AMS) Soluble Crystal Spray Adjuvant 2.50 lb/ac; Basagran 1.00 pt/ac; Herbimax 25.60 fl oz/ac;

Intensity 8.00 fl oz/ac; Raptor 4.80 fl oz/ac

9-2-20: Harvest Desiccant: Actamaster (AMS) Soluble Crystal Spray Adjuvant 2.50 lb/ac; Gramoxone SL 2.0 1.00 qt/ac

MSO Concentrate Methylated Seed Oil 1.60 pt/ac; Sharpen 2.00 fl oz/ac

Seed Treatment: Maxim®, Apron®, Rancona®, Cruiser®, and Vibrance®

Foliar Fungicides: 7-20-20: Aproach 12.00 fl oz/ac; Awaken 1.00 qt/ac; Radiate 2.00 fl oz/ac

Insecticides: 7-1-20 Mustang Maxx 4.00 fl oz/ac, 20.72 ac border spray; 7-9-20: Herbimax 15.36 fl oz/ac 5.13 gal;

Sniper 6.80 fl oz/ac (42.71 ac area treatment)

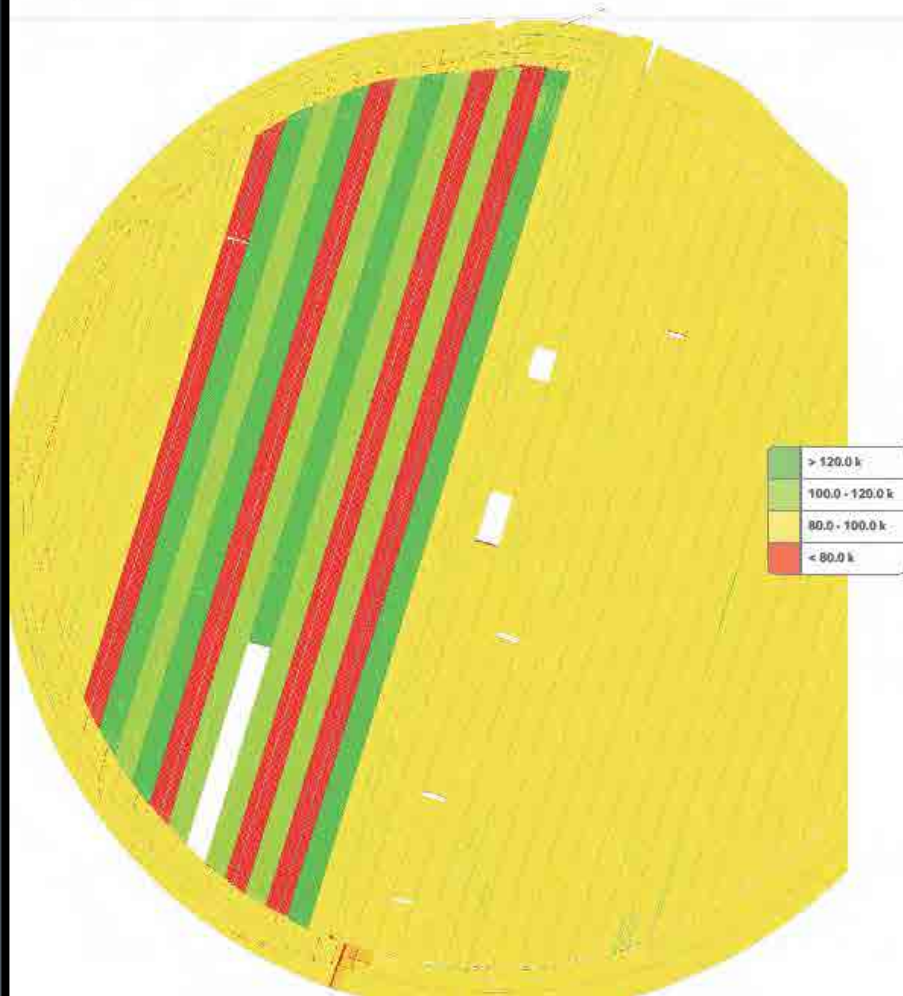
Fertilizer: 20 ton/ac manure in 2019

Irrigation: Pivot, Total: 10-12 inches

Rainfall (in):

Hall Land 2

H3 | Hall Land



Pinto Bean Planting Population for Direct Harvest, Angora (Morrill County) 2020

Moderate weed pressure, some heavy areas

Target Trt (Plts/ac)	Stand Count (plts/ac)	Pod Height (% >2")	Harvest Loss (bu/ac)	Percent Small	Yield† (bu/ac)	Marginal Net Return‡ (\$/ac)
60,000	46,381 A*	68 A	3.4 A	3.4 A	33.9 A	444.59 A
100,000	66,196 B	75 B	2.7 A	4.1 AB	37.3 B	475.41 AB
130,000	84,977 C	84 C	2.1A	4.6 C	39.2 B	486.21 C
P-Value	<0.0001	0.0011	0.2057	0.0527	0.0052	0.0688

(38,596) population difference)

*Values with the same letter are not significantly different at a 90% confidence level.

†Bushels per acre are corrected to 14% moisture and adjusted for clean yield (% splits, % small, and % foreign material removed).

‡Marginal net return based on \$24/cwt (\$14.40/bu at 60lb/bu). Seed cost for the Vibrant pinto bean seed was \$84/100,000 seeds.

Seed costs for each treatment were: \$42.86/ac for 51,019 seeds/ac, \$61.17/ac for 72,816 seeds/ac, and \$78.52/ac for 93,475 seeds/ac.

- Surrounding field was Vibrant, total field average yield was 31.7 bu/ac.

Morrill County Pinto Population Study



Morrill County Pinto Population Study



Season Long Bean Study, Angora 2020

(66,196 population)

note: no row closure, weed pressure, wheat cover crop,



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Pinto Bean Planting Population for Direct Harvest, Berea (Box Butte County) 2020

Pinto Bean Planting Population for Direct Harvest

Study ID:

County: Box Butte

Soil Type: Sandy loam

Planting Date: 5/26/20

Harvest Date: 9/19/20 (Deere® S780 combine/ MacDon® FD-75 35' head.)

Row Spacing (in): 20" planted

Variety: Lumen

Reps: 4

Previous Crop: Sugar Beets

Tillage: Ripped with no-till ripper then roller harrow, rolled after planting

Herbicides:

Pre: May 24, 2020 Warrant 1.25 qt/ac; 6-1-2020 Actamaster (AMS) Soluble Crystal Spray Adjuvant 2.50 lb/ac;

Liberty 280 SL 32.00 fl oz/ac; MSO Concentrate Methylated Seed Oil 0.20 pt/ac; Roundup PowerMAX 32.00 fl oz/ac

Post: 6-21-2020 Medal EC 1.00 pt/ac; 6-29-2020 Actamaster (AMS) Soluble Crystal Spray Adjuvant 2.50 lb/ac;

Basagran 1.00 pt/ac; Herbimax 25.60 fl oz/ac; Raptor 4.00 fl oz/ac

Desiccant treatment: 9-12-2020 Actamaster (AMS) Soluble Crystal Spray Adjuvant 12.50 lb/ac;

Gramoxone SL 2.0 1.00 qt/ac; MSO Concentrate Methylated Seed Oil 1.60 pt/ac; Sharpen 2.00 fl oz/ac

Seed Treatment: Maxim®, Apron®, Rancona®, Cruiser®, and Vibrance®

Foliar Fungicides: 7-17-2020 Aproach 12.00 fl oz/ac; Awaken 1.00 qt/ac; Radiate 2.00 fl oz/ac

8-11-2020 Nu-Cop 3L 32.00 fl oz/ac

Insecticides: 5-27-2020 Capture LFR 3.40 fl oz/ac

Fertilizer: 5-27-2020 Radiate 2.00 fl oz/ac; RiseR 7-17-3 2.00 gal/ac

5-28-2020 (bean coulters) 12-0-0-26S Thiosul 2.00 gal/ac; 32-0-0 UAN 18.00 gal/ac, Black Max 22 2.00 qt/ac;

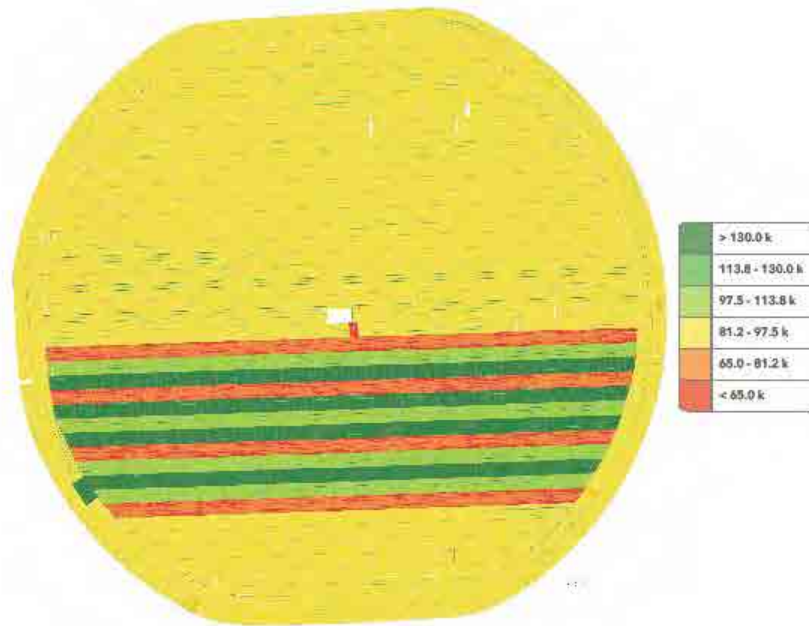
ProTetra 4-0-0 2.00 qt/ac

Irrigation: Pivot, Total: 10-12 inches

Rainfall (in):

North Alliance 9

H3 | North Alliance



Pinto Bean Planting Population for Direct Harvest, Berea (Box Butte County) 2020

Target Trt (Plts/ac)	Stand Count (plts/ac)	Pod Height (% >2")	Harvest Loss (bu/ac)	Percent Small	Yield† (bu/ac)	Marginal Net Return‡ (\$/ac)
60,000	52,478 A*	66 A	2.2 A	4.5 A	52.9 A	712.54 A
100,000	82,201 B	79 B	1.8 A	3.2 A	56.6 B	738.11 AB
130,000	106,752 C	85 C	1.8A	3.4 A	59.2 C	753.02 C
P-Value	<0.0001	0.0004	0.2057	0.5073	0.0028	0.0585

(54,274) population difference)

*Values with the same letter are not significantly different at a 90% confidence level.

†Bushels per acre are corrected to 14% moisture and adjusted for clean yield (% splits, % small, and % foreign material removed).

‡Marginal net return based on \$24/cwt (\$14.40/bu at 60lb/bu). Seed cost for the Vibrant pinto bean seed was \$84/100,000 seeds.

Seed costs for each treatment were: \$48.49/ac for 57,726 seeds/ac, \$75.95/ac for 90,421 seeds/ac, and \$98.64/ac for 117,427 seeds/ac.

- Surrounding field was Lumen, total field average yield was 56.4 bu/ac.

Box Butte County Pinto Population Study



July 16, 2020

Box Butte County Pinto Population Study



August 7, 2020
Row Closure fairly good

Pinto Bean Inoculation for Direct Harvest (Box Butte County) 2020

Pinto Bean Planting Population for Direct Harvest

Study ID:

County: Box Butte

Soil Type: Sandy loam

Planting Date: 6/5/20

Harvest Date: 9/22/20 (Case 7088 Combine, MacDon 30-foot flex draper)

Row Spacing (in): 15" drilled

Variety: Torreon Pinto Bean

Treatment: Verdesian Ncharge; 2.5 oz/50 lbs seed

Rhizobium leguminosarum biovar *phaseoli*

Reps: 6

Previous Crop: Corn

Tillage: 2 disking's rolled then planted

Herbicides:

Pre: 30 oz Prowl, 15 oz Outlook, 64 oz Roundup (May 29, 2020)

Post: 4 oz Raptor, 30 oz Basagran, 10 oz Select (~ June 8th)

Seed Treatment: Maxim[®], Apron[®], Rancona[®], Cruiser[®], and Vibrance[®]

Foliar Fungicides: None

Insecticides: None

Fertilizer: None

Irrigation: Pivot, Total: 11-12 inches

Rainfall (in):



Verdesian Ncharge; 2.5 oz/50 lbs seed

Pinto Bean Inoculation for Direct Harvest (Box Butte County) 2020

Serious Hail, July 9, significant leaf loss

Target Trt (Plts/ac)	Stand Count (plts/ac)	Pod Height (% >2")	Harvest Loss (bu/ac)	Percent Small	Yield† (bu/ac)	Marginal Net Return‡ (\$/ac)
Inoculated	91,191 A*	83 A	4.8 A	2.6 A	37.8 A	541.65 A
No Inoc.	102,880 B	82 A	4.9 A	3.4 A	38.2 A	550.38 A
P-Value	0.0110	0.5965	0.9240	0.3457	0.6031	0.5150

(11,689) population difference)

*Values with the same letter are not significantly different at a 90% confidence level.

†Bushels per acre are corrected to 14% moisture and adjusted for clean yield (% splits, % small, and % foreign material removed).

‡Marginal net return based on \$24/cwt (\$14.40/bu at 60lb/bu). Inoculant (Verdesian Ncharge; 2.5 oz/50 lbs seed) cost to calculate marginal net return is \$2.13/ac - Surrounding field was Torreón, total field average yield was 42.08 bu/ac.

Box Butte County Inoculation Study



Pinto Bean Planting Population for Direct Harvest (Box Butte County, Alliance) 2020

Pinto Bean Planting Population for Direct Harvest

Study ID:

County: Box Butte

Soil Type: Sandy loam

Planting Date: 5/29-6/2/20

Target populations: 60, 100 and 130,000

Harvest Date: 11/6/20 (New Holland CR9065, 40' New Holland Flex Draper head)

Row Spacing (in): 30 inch twin row

Variety: Cowboy Pinto

Reps: 4

Previous Crop: Corn

Tillage: Cattle, vertical tillage w/Krause, planted then rolled

Herbicides:

Pre: June 3; 32 oz Roundup, 2 oz Aim burndown,

1 Pt Dual Magnum (rolled then sprayed)

Severe wind June 6, unwatered herbicide largely ineffective

Post: June 26; 4 oz Raptor, 1.2 pt Basagran

Seed Treatment: Maxim[®], Apron[®], Rancona[®], Cruiser[®], and Vibrance[®]

Foliar Fungicides: None

Insecticides: None

Fertilizer:

Irrigation: Pivot, Total: 11-12 inches

Rainfall (in):

Pinto Bean Planting Population for Direct Harvest (Box Butte County, Alliance) 2020



(Planted 5/29-6/2)

Pinto Bean Planting Population for Direct Harvest (Box Butte County, Alliance) 2020



(July 9, 2020)



(August 17, 2020)

Weeds: Kochia, Lambsquarters, Redroot Pigweed, Palmer Amaranth

Pinto Bean Planting Population for Direct Harvest (Box Butte County, Alliance) 2020



(August 17, Palmer Amaranth)



(Harvest Nov. 6, 2020 Yield ~23 bu/ac)



Great Northern Bean Planting Population for Direct Harvest (Sheridan County) 2020

Pinto Bean Planting Population for Direct Harvest

Study ID: Sheridan

Soil Type: Sandy loam

Planting Date: 6/4/20

Harvest Date: 10/14/20 (Beans swathed/windrowed, Pickett Combine)

Row Spacing (in): 10" drilled

Variety: Hydra Great Northern

Reps: 4

Previous Crop: Corn

Tillage: Disk then field cultivator twice

Herbicides:

Pre: No pre-emergent herbicide used

Post: 4 oz Raptor, 1.2 pt Basagran, (~ July 3)

2pts Basagran (rescue treatment, July 24)

Rope-wicked with Gramaxone (Late August)

Seed Treatment: Maxim[®], Apron[®], Rancona[®], Cruiser[®], and Vibrance[®]

Foliar Fungicides: None

Insecticides: None

Fertilizer:

Irrigation: Pivot, Total: 11-12 inches

Rainfall (in):

Sheridan County Population Study 2020



Early July 2020



August 17, 2020

Sheridan County Population Study 2020



Rope Wick Gramoxone, late August



Beans swathed/windrowed,
Then Pickett Combine used

Final Yield= ~37 bu/ac

Populations Summary 2016-20

- For beans planted in 10 studies over the previous 4 years with population differences ranging from 27,859 within a study to 56,234 difference within the study:
 - Only three studies had significant yield differences with the greatest yields in the higher population.
 - Only one study had a significantly different Marginal Net Return and it was in the high population in the study with the lowest population difference.
 - In 2020 both pop. studies had highest yields and net marginal returns in the high population. However, our high populations were 85 and 106,000 and low populations were in the mid 40's to low 50's. I want to look at low populations in the 60's and high pop 125 to 130,000.
- Concluding Remarks
 - Growers may be able to reduce seeding rates and save money while maintaining competitive yields.
 - I want to look at this for a couple more years to draw stronger conclusions.
 - Look at Inoculant again in a year with more favorable growing conditions.



Why Direct Harvest?

- Fewer harvest operations
- Can't find good labor for early morning cutting operation
- Avoid risk from wind or rain after cutting
- Don't disturb soil – maintain more residue
- Less soil through combine



Why Isn't Everyone Direct Harvesting?

- Will take longer to get crop out of field
- Need to learn a new production system
- Need to buy a different combine head
- Neighbor had a disaster
- Can't cultivate to control weeds
- May need to plant more seed/A ??
- Total harvest loss will be higher
 - 2-3 bu/ac (direct harvest) vs 1-2 bu/ac (traditional harvest)

Bean Plant Types, Plant Architecture

- Type 1
- Determinate Bush
- Kidney, Cranberry



Plant Types

- Type 2
 - a- no guides
 - b- guides
- Indeterminate Bush
- Great Northern
- Pinto



Plant types

- Type 3
 - a- no guides
 - b- guides
- Indeterminate
- Prostrate
- Great Northern
- Pinto



Many pods lower than 2 inches



Most pods higher than two inches



Potential for High Harvest Loss is the Greatest Negative



Check this early and regularly. Adjust / Correct

Harvest Loss Counts





Critical to Successful Direct Harvest

1. Suitable upright variety
 - Holding pods above 2" at harvest
2. Very level field surface
3. Good weed control
 - Won't be able to cultivate
4. Suitable header
 - Flex draper heads work well, flex auger heads can work well
5. Operator- knowledgeable with adjustments, harvest speed, and checking harvest loss

Big Thanks!

- Nebraska Dry Bean Commission
- Kelley Bean Company
- Trinidad Benham
- Cooperating Growers
- Nebraska On Farm Research Network



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Questions

