

N EXTENSION
On-Farm Research
Field Pea Planting Population

Study ID: 175135201601

County: Perkins

Soil Type: Mace silt loam, 1-3% slopes; Rosebud-

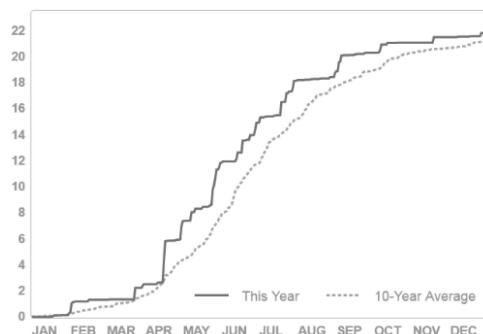
Canyon loams, 1-3% slopes

Reps: 4

Variety: Salamanca

Tillage: No-Till

Rainfall (in):



Study Objective: Grain-type field peas are a cool season grain crop (mid-March to late-July) typically grown as an alternative to no-till summer fallow in a semiarid cereal-based no-till cropping system such as wheat-corn-fallow and/or wheat-fallow. Very little information is available on how field peas respond to different agronomic practices in semiarid Nebraska. **The objective of this study was to determine the economically optimal planting (EOP) population to grow field peas in western Nebraska.** The EOP can be defined as a population that maximizes profit made on investment, which in this case is seed.

Research Sites and Experimental Design: The study investigating the effects of different planting populations on field pea grain yield was conducted in 2016 under an established no-till system in Perkins County. The experiment was set up as a randomized complete block design with seven treatments (seeding rates) replicated four times. The choice of seeding rates was based on current recommended plant population of 310,000 plants/acre and three populations under and over that recommendation.

The drill was calibrated for seeding rate (seed/lb) by dividing targeted plant population (plants/acre) by multiplier of seeding weight (seed/lb) and percent germination rate for the field pea cultivar Salamanca. The study was planted in strips that were 40 feet wide and 300 feet long. Plant population data (plants/ft²) was collected after the crop had an established stand (V3-V5 growth stage). Population counts were conducted in each strip by conducting four counts from a 25 ft² area. Grain yield data was collected by harvesting the middle 30 feet of each strip; a grain cart with built-in scale was used to record grain weight; and a subsample of grain was taken from the combine to record grain moisture content. Final grain yield was adjusted to 12% moisture for each strip. Yield response to actual plant population (plants/acre) was modeled using asymptotic regression model.

Results:

Data were analyzed using R: A language and environment for statistical computing. R Development Core Team (2016). R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, <http://www.R-project.org>.

Yield response to plant population increased linearly from 15-20 bu/ac at low densities (0 to 150,000 plants/acre), then continued to increase from 20-24 bu/ac with decreasing rate at medium densities (150,000-200,000 plants/acre), then started to plateau from 24-26 bu/ac at about 200,000 plants/acre, and reached its maximum at approximately 310,000 plants/acre (Figure 1). Yield response at populations higher than 310,000 plants/ac was seldom observed; therefore, the effects of plant population for yield goals higher than 26 bu/ac need to be further investigated.

Assumptions for calculating EOP:

- Field pea variety has 2,100 seeds/lb, test weight of 60 lb/bu at 12% moisture, and 90% germination
- Hail event or some other factor that may reduce stand count after emergence does not occur
- Price to purchase certified field pea seed = \$15/bu
- Price of field peas on the market = \$7/bu

According to the results of this study and using the aforementioned assumptions, the economically optimal population (i.e., maximum profit) for field peas is 220,000 plants/acre, which corresponds to a 116 lb of seed/acre seeding rate (Figure 2). A penalty of \$0.19/acre may occur for each additional pound of seed planted over this EOP. The current practice of many farmers in Central Great Plains is 180 to 200 lb/acre; therefore, EOP may save farmers up to \$16/acre. Planting higher populations to maximize yield potential is not always the best economic strategy due to the asymptotic nature of yield response to planting density.

Conclusion: Although this study shows the potential for reduction in field pea population without lowering profits, these results are yet to be confirmed in additional production years and/or locations and should be taken with caution until further research is completed and the results have been validated. Current recommendations for field peas seeding rates range from 180 to 200 lb/ac. UNL has been awarded a Research and Extension SARE grant for additional field pea research (2017-2020).

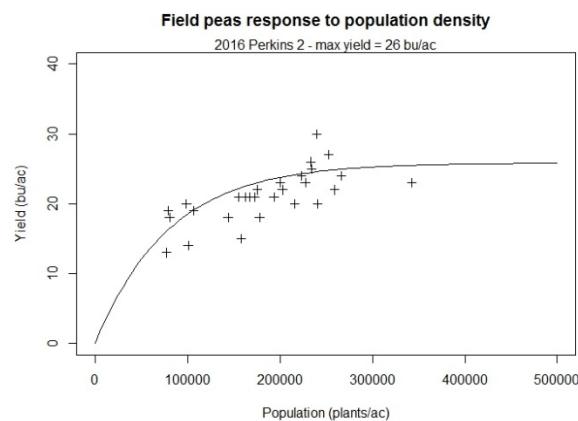


Figure 1. Field pea response to population density for three site years.

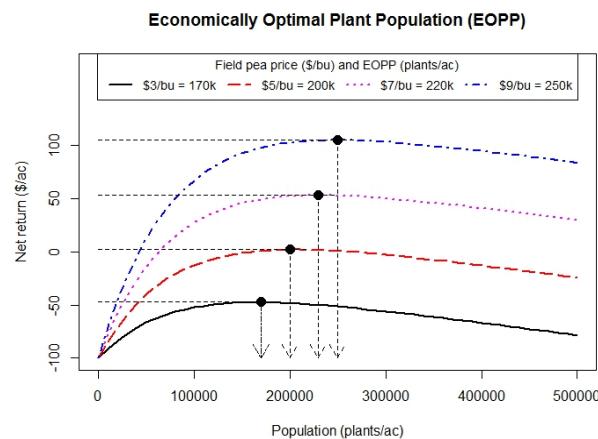


Figure 2. Economically optimum population: profitability as affected by field pea population and price of field peas

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