



Target 6 to 7 canola plants per square foot

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A meta-analysis of canola yield response to plant densities found that the economic optimal canola plant stand is 6 to 7 plants per square foot assuming recent 3 year average hybrid seed cost of \$11.84/lbs., and farmgate canola price of \$10.22/bu, hybrid seed size of 5 gram per thousand seeds, and emergence percentage of 60%.

Research was conducting using a meta-analysis of western Canadian hybrid canola seeding rate research (85 site-years) with measured canola plant densities was conducted to estimate the average yield response due to increasing plant density. The estimated yield responses were then used to calculate value of yield added versus extra seed cost from increasing plant density and whether the current target plant population of 5 to 8 plants/ft² (50 to 80 plants/m²) was the most economic target plant stand.

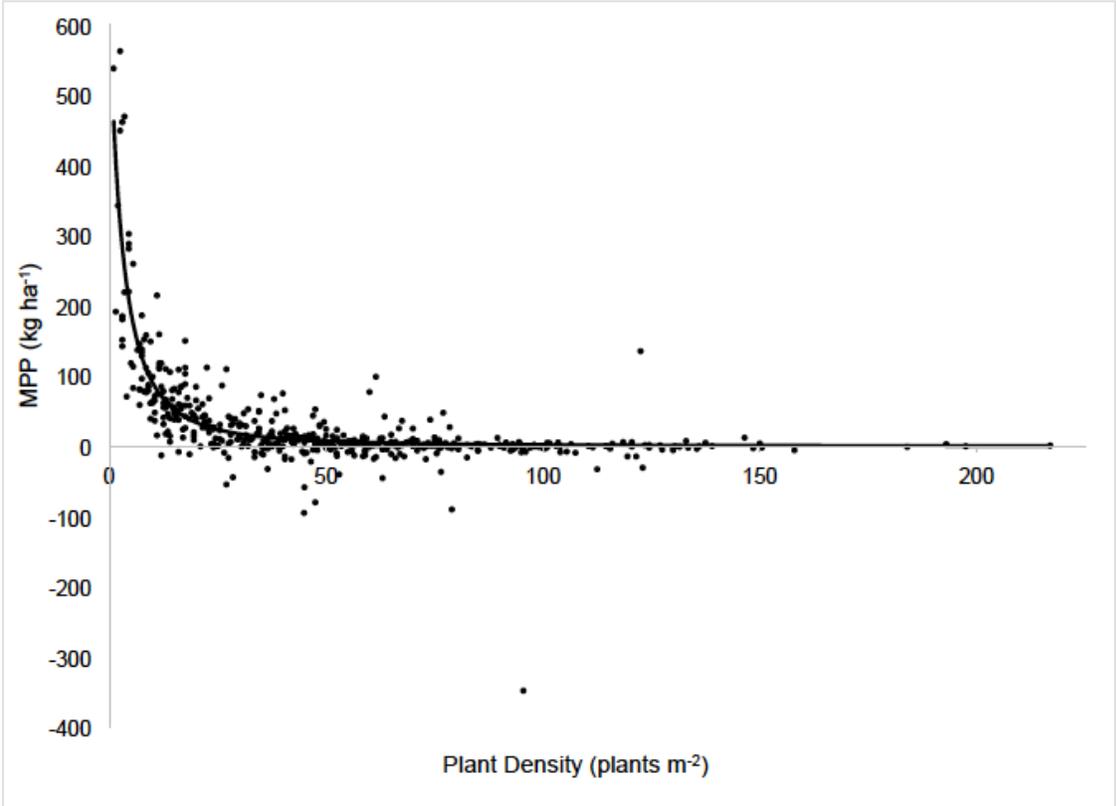
A meta-analysis involves systematically collecting and combining results from multiple studies into a single integrative statistical analysis. A marginal yield response curve was used to derive economic optimal density using different values for TSW, emergence, seed cost, and canola price.

The economic optimal canola hybrid density was estimated at 6 to 7 plant/ft² (62-73 plants/m²) assuming a hybrid seed cost of \$11.84/lbs., a canola farmgate price of \$10.22/bu, and average values

for hybrid seed size of 5 gram per thousand seeds and emergence percentage of 60%. This target plant stand density aligns with current Canadian recommendations.

However, at the high spring 2021 canola prices around \$16/bu (\$700/T), and a hybrid seed cost of \$14/lbs. (\$31/kg), the estimated optimal density is 7.2 to 8.6 plants/ft² (72 to 86 plant/m²).

Scatterplot of canola marginal physical product (MPP) (kg/ha) x plant density (plants/m) data and estimated Bleasdale marginal physical product (MPP) response curve



Source: Hartman and Jeffrey. 2020

The economic analysis showed that canola price, hybrid seed price, thousand seed weight, and emergence percentage all affected the optimal economic target density. There can be combinations of these values that lead to economic densities outside the current recommended range.

Adjust for your risk tolerance

The recommended plant density range and economic optimal density from this meta-analysis should be regarded as a starting point for canola grower decision-making. Other factors can affect a canola grower's personal risk preference for target plant densities. For example, low density leads to increased days to maturity and increased green seed. Low density also contributes to uneven maturation that may complicate harvest management.

Other issues with low plant density includes an extended flowering periods with more branching, which can make timing of sclerotinia fungicide application or harvest timing more difficult. Low plant densities also lead to plants with larger main stems, which can be slow to dry down in the fall, which can delay harvest. Increasing plant density could help overcome these risks, although at a higher seed cost.

Increased plant density from higher seeding rates can increase early season canola plant biomass, which research has shown can reduce weed biomass and competition, and soil weed seed banks. Conversely, in fields with substantial weed pressure, low canola densities increase the need for a second in-crop herbicide application. This increases cost as well as the potential for weeds developing herbicide resistance. In areas that experience high winds during fall periods, growers also often prefer higher plant populations to more firmly anchor swaths and reduce the risk of significant harvest loss.

Given that canola price, hybrid seed price, thousand seed weight, emergence percentage, and other agronomic factors contribute to optimal seeding decisions, a decision support application could help growers to determine the economic optimal density. Incorporating individual grower perspectives on factors such as green seed risk, weed management, mid-season plant loss, swath anchoring, and other agronomic factors should also be considered when developing a decision support app.

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Mr. Murray D. Hartman and Dr. Scott R. Jeffrey. Estimating the economic optimal target density of hybrid canola based on data from a western Canadian meta-analysis. *Canadian Journal of Plant Science*. **Just-IN** <https://doi.org/10.1139/CJPS-2020-0162>