Winter Oilseed Grower Bulletin #8: How can we ensure pennycress profitability?

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Recent studies of pennycress (*Thlaspi arvense* L.) have primarily considered agronomic management or breeding advancements, however, the economic benefits and challenges are of equal consideration to ensure future success on the oilseed market. Profitability is a chief concern for all growers, so how much pennycress do you need to grow to make a profit? Although pennycress markets have not been developed yet, we can make educated estimations using the market values for rapeseed oil and meal, which has a comparable oil composition and end uses as our current lines of industrial-grade pennycress. Averaged over five years, rapeseed oil and meal prices were valued at $0.39 and $0.12 per pound, respectively (Oil World, 2019). Field production cost is another important expense to factor into our calculations. Based on other studies on oilseed economics (Gesch et al., 2014), we developed an equation to estimate the combined value of pennycress while taking into account field production costs. Field production cost estimates include fertilizer input, equipment use and associated fuel and labor costs, and seed cost, along with other typical production expenses.

One way to predict how much pennycress is needed to be profitable is to consider oil content. Once pennycress is mature, oil content typically ranges between 26 and 36%. Based on this range, rapeseed oil and meal market values, and our typical production costs, we can then predict the pennycress yield required to offset the cost of production. Based on Table 1, we can see that this yield ranges approximately between 1100 and 1250 lb ac^{-1}.

Table 1. Predicted pennycress yield required to breakeven based on oil content and oil and meal market values.

Oil content	Industrial-grade pennycress	Food-grade pennycress
%	lb ac^{-1}	lb ac^{-1}
26	1249	1051
27	1231	1038
28	1214	1026
29	1197	1014
30	1181	1003
31	1165	991
32	1149	980
33	1134	969
34	1120	959
35	1105	949
36	1091	938

Current pennycress lines typically yield between 445 and 623 lb ac^{-1} in research trials, but have yielded as high as 2400 lb ac^{-1} (Cubins et al., 2019) indicating that it is possible to recover production costs Gand

be profitable at this time. With that being said, yield consistency will be key to consistently reaching the breakeven point, and there are a few important considerations to keep in mind. Our current pennycress lines retain weedy characteristics such as seed shatter, which means that seed pods break easily as they approach harvestable maturity (Fig. 1). This greatly affects pennycress yield stability and can correspond to over 50% seed loss before harvest (Cubins 2019). There also may be food-grade lines of pennycress available in the future, which will have greater oil and meal values compared to the current industrial-grade lines. For comparison, we can consider canola as a market surrogate where oil and meal are valued at $0.42 and $0.15 per pound, respectively. This will decrease the yield required for pennycress to reach the profitability threshold (Table 1). Our breeding team is addressing these concerns by developing new and improved pennycress lines with reduced seed shatter and edible oil and meal.

Figure 1. Germinated pennycress from shattered seed following mechanical harvest at full maturity at a research site in Rosemount, MN (2018).

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