

Legume crops are used in crop rotations to improve soil health and as a break in cereal dominant cropping systems. They are beneficial due to their N-fixing properties with several non N-related benefits including interruptions in pest cycles (weed, disease, insect), improved soil structure and release of growth promoting substances (Przednowek et al., 2004). Lentil and pea crop dominate western Canadian pulse acres and the need for a new crop is evident. The introduction of other legumes into NW Saskatchewan is promising and is in need of further research. Therefore the intent of this study conducted at the AAFC Scott Research Farm during the 2016 growing season was to compare the rotational benefits (residual N) of five annual grain legumes: faba bean, chickpea, soybean, lentils, and peas using a non- legume: flax, as a reference crop.

The results showed that residual soil N was significantly affected by crop type at all soil depths (Figure 1). Residual N levels were similar between chickpea, faba bean, and soybean at all soil depths (Figure 1). In a study conducted by Walley et al. (2007) it was found that chickpeas typically fix lower levels of N causing a soil N deficit or neutrality following crop harvest. This is not the case with high water supply as chickpeas N mineralization rate is higher (Gan et al., 2009).

Residual N levels after the legumes in this study were lower than expected. Other similar studies showed slightly differing results with higher residual N levels reported. This difference may be due to the higher yield of legumes in this study because a large portion of the N is removed when the crop is harvested (Figure 1a and 1b). The trend of the respective contribution of all the legumes to residual soil N was the same in all soil depth increments: 0-6", 6-12", 12-24" and 0-24", so only the top 12" was reported in this factsheet.

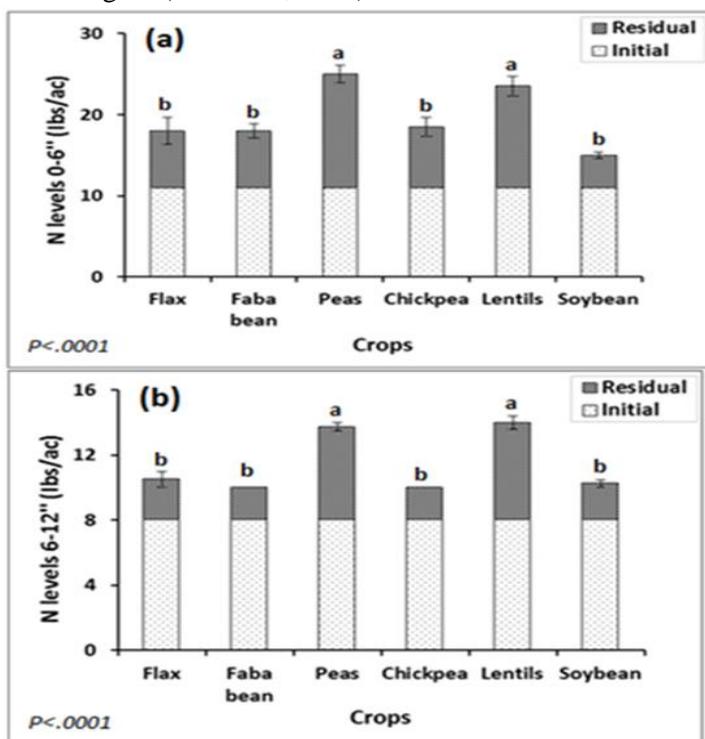
The trend in the residual N among the crops in this study may be due to differences in mineralization rates due to the C and N contents of the crops. For example, studies found that N mineralization from soil and crop residues is negatively correlated to the C to N ratio (Booth et al., 2005; Heal et al., 1997) and positively correlated to N content (Lupwayi and Kennedy, 2007), although other residue quality factors (e.g., lignin content) also affect N mineralization (Heal et al., 1997).

From the study, lentils and peas had the highest residual N, significantly higher than the other crops. Despite the lower plant density and grain yield in chickpea relative to the recommended values, it had residual N similar to faba bean and soybean in all depth increments.

From the results, it can be concluded that, pending the actual effects of the residual N on wheat yield and N economy, legumes have enormous benefits as part of existing rotations so producers should continue incorporating them in their rotations.

Finally, since both lentils and peas are already adapted to the conditions of northwestern Saskatchewan, they still remain viable pulse/legume options for producers in their rotations.

Full report at: <http://www.westernappliedresearch.com/research/warc-annual-reports/2016/>. Project was supported by the Agricultural Demonstration of Practices and Technologies (ADOPT) initiative under the Canada-Saskatchewan Growing Forward 2 bi-lateral agreement.



**Figure 1:** Effects of crop type on soil residual N at 0-6" (a) and 6-12" (b)