Mapping and Managing Canada Thistle (Cirsium arvense) with Drone-Based Precision Tools

Sasha Loewen

Abstract:

Canada thistle (*Cirsium arvense*) remains one of the most costly weeds on organic prairie farms, driven by deep perennial roots, rapid vegetative spread, and strong regenerative capacity. Traditional control relies on repeated tillage—effective but ecologically damaging—while alternative strategies such as mowing, competitive crops, or biocontrol have shown mixed success. New remote sensing tools offer a complementary pathway: enabling farmers and researchers to observe, track, and target thistle patches. We evaluated affordable drone-based imaging, open-source processing (WebODM, QGIS, R), and topographic metrics to develop a practical mapping and decision-support workflow for organic grain farms. Across multiple crops, elevations, and flight dates, thistle patches were detected with high accuracy when infestations formed distinct canopy signatures, while diffuse, low-density infestations remained challenging. Topographic Position Index (TPI) consistently predicted patch location and growth potential, highlighting landscape controls on thistle ecology. On-farm experiments further showed that higher crop seeding rates suppressed thistle growth, indicating strong potential for integrating maps with variable-rate seeding to locally intensify competition against thistle. This work demonstrates that simple, scalable remote sensing workflows can help farmers discover and describe thistle patches, test targeted management, and document outcomes—laying the foundation for site-specific, cost-effective Canada thistle control in organic systems.