AGRONOMY

# Research and Technical Support for On-Farm Transition to Organic Soybean Production

Organic, non-GM soybean yields are heavily influenced by the growing environment and weed pressure. Co-designed farming systems that integrated researchers and farmers aided the transition to organic soybean production.

**DEMAND FOR ORGANIC** soybeans is growing, although technical knowledge and suitable varieties are barriers to farmer uptake. This project addressed those barriers by evaluating varieties on-farm under organic conditions and by offering a *farming system co-design* process of technical support for farms seeking to transition a portion of their land to organic production.

## ON-FARM VARIETY EVALUATION

Most non-GM soybean varieties are developed under weed-free conventional conditions. In this experiment, twelve non-GM soybean varieties were evaluated on five organic farms and one transition-to-organic farm in southern Manitoba in 2014 and 2015. On each organic farm, variety performance was compared with a weed-free sub-plot. Weed management under organic conditions consisted of pre-emergence harrowing and inter-row cultivation at V1–V2.

Growing environment contributed more to soybean yield than variety choice. Factors that encouraged weed growth, such as high soil nitrogen (N) at seeding, soil organic matter and soil potassium level had a greater impact on yield than variety choice. It is, therefore, recommended that organic soybeans be grown on land with very low soil N, where adequate weed control options are available.

Based on expected organic soybean yield for the area and recent organic prices, this study found that soybeans were profitable even with a 20% yield loss to weeds. However, with better weed control tools now available, a 20% yield loss can be avoided. The effect of variety choice on weed biomass at soybean maturity was insignificant. Moreover, early-and late-maturing soybeans suffered similar yield loss due to weeds. Additional variety traits deemed important were rapid and efficient nitrogen fixation and tolerance to weed competition.

## FARMING SYSTEM CO-DESIGN

The *farm system co-design* process is a new approach to farm planning, bringing farmers and researchers together, easing the transition for farmers entering the organic soybean market.

In co-designed systems, researchers bring their knowledge of theories and research results to complement farmers knowledge of soils, equipment, labour and markets. Together, the farmer and researcher come up with several scenarios that could help meet the farmer's goals. Then, with the support of the researcher, the farmer executes a scenario, making adjustments along the way. The farmer-researcher team observe, learn and adapt the plan accordingly.

Twelve farms participated in the co-design. Scenarios tested by conventional and transitional farmers focused on green manures and establishing an organic rotation. Established organic farmers tested row spacing, in-crop tillage, seeding rates and variety choices. One-on-one interactions with researchers provided valuable knowledge to aid the transition process. This program also enabled farmers to connect, creating a community of farmer learning and support. Visit umanitoba.ca/outreach/naturalagriculture to connect with the researchers in this program.

**Table 1. Non-GM soybean varieties tested under organic conditions.**

| Variety | Relative Maturity | Soybean Yield (bu/ac) | Soybean Yield Loss Due to Weeds (%) |
|---|---|---|---|
| Tundra | 000.5 | 21.8 b | 37 |
| SK0007 | 000.7 | 21.7 b | 32 |
| OAC Prudence | 00.7 | 21.1 b | 30 |
| Toma | 00.7 | 23.6 ab | 28 |
| OAC Petrel | 00.5 | 22.3 b | 36 |
| DH 863 | 00.6 | 24.3 ab | 28 |
| DH 401 | 00 | 20.6 b | 28 |
| Jari | 0.5 | 21.2 b | 27 |
| Auriga | 0.5 | 24.1 ab | 36 |
| SVX14T0053 | 0 | 23.3 b | 34 |
| Savanna | 0.4 | 26.9 a | 31 |
| Krios | 0 | 23.4 ab | 32 |

Different letters within columns indicate statistically significant differences among treatments.

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