

# Economics of herbicide tolerant canola systems in IWM

In integrated weed management (IWM) systems, growers can manipulate factors like herbicide systems, herbicide rates and herbicide timing in an effort to reduce weed competition while maximizing yield. But with a range of costs for seed, technology use agreements, and herbicides, comparing IWM strategies on the farm, from a risk and return perspective, can be difficult. For example, cutting herbicide rate may reduce cost, but it might also increase weed competition, reduce yield, and contribute to increased risk.

An economic analysis of a research study conducted by scientists at Agriculture and Agri-Food Canada's Lacombe, Lethbridge and Beaverlodge Research Centre is shedding some light on how economics are affected by IWM strategies. The multi-year, field experiment looked at the interaction of herbicide-tolerant systems, herbicide rate and timing of application on average annual net return and risk in the short-term.

Roundup Ready® (glyphosate-resistant), LibertyLink® (glufosinate-resistant), and Clearfield® (imidazolinone-resistant) canola systems were compared, and 50 or 100% of recommended herbicide rate was applied as a single herbicide application as close as possible to either the two-, four- or six-leaf stage of canola.

Overall, yields were similar between herbicide systems and at both herbicide rates. Yields were highest for weed removal at the four-leaf stage of canola.

## Net return trends favour early weed removal

Net return was affected by herbicide system, herbicide rate and time of weed removal. For example, the mean net return at Lacombe varied from a low of \$297 per hectare (Liberty at full label herbicide rate applied at the two leaf stage) to a high of \$485 (Roundup at 50% label rate at four-leaf stage).

The strategy that maximized net return at Lacombe depended on the herbicide system and the time of weed removal. Roundup at early weed removal (two- or four-leaf) and Liberty at the four-leaf stage had the highest net returns. The lowest net return was more frequently observed in three treatments: at the six-leaf stage; Clearfield® at the full label rate; and Liberty at the two-leaf stage. The most consistent net return was for Roundup at the 50% herbicide rate.

At Lethbridge, the mean net return varied from \$59 (Clearfield® with 100% herbicide rate at two-leaf stage) to \$307 per hectare (Clearfield® at 100% herbicide rate at the four-leaf stage). The IWM strategy that included Roundup cultivars and weed control at the four-leaf stage generally had the highest means, but these were not significantly different from many other treatments.

## Assessing risk

The IWM strategy with the lowest risk premium was generally consistent for both risk neutral and risk averse growers. A risk premium (RP) is the amount an individual would willingly pay to convert a risky prospect into a certain prospect with zero risk. In this study, any IWM strategy that included a RP less than \$58 per hectare would be considered risk efficient, as highlighted in the table below.

Ranks of strategies by risk premium for different risk attitudes.

Risk averse		Risk neutral	
Lacombe IWM strategy*	Risk premium (\$/ha)	Lacombe IWM strategy	Risk premium (\$/ha)
GLY-50-4L	0	GLY-50-4L	0
GLY-50-2L	61	GLY-100-2L	39
GLY-100-2L	76	GLY-100-4L	45
GLY-100-4L	88	GLU-50-4L	50
GLU-50-4L	90	GLU-100-6L	57
Lethbridge IWM strategy	Risk premium (\$/ha)	Lethbridge IWM strategy	Risk premium (\$/ha)
IMA-100-4L	0	IMA-100-4L	0
GLY-100-4L	32	GLY-50-2L	12
IMA-50-4L	36	IMA-50-4L	18
GLY-50-2L	52	GLY-100-4L	31
GLY-50-6L	61	GLY-50-4L	44

\*Glufosinate (GLU), glyphosate (GLY), and imazethapyr (IMA) herbicide systems applied at 50 or 100% of recommended dose, and weed removal at the two- (2L), four- (4L), and six-leaf (6L) stages of canola. Source: Upadhyay, B.M., Smith, E.G., Clayton, G.W., Harker, K.N., Blackshaw, R.E., 2006. Economics of integrated weed management in herbicide-resistant canola. Weed Sci., 54:138-147.

The results indicate that the reduced rate of herbicide was just as likely to be among the risk-efficient strategies as the full rate, indicating that reduced herbicide rates could be profitable. However, growers are cautioned to understand the risk when cutting rates, and that they are solely responsible for the performance of the herbicide when doing so. In addition, applying herbicides at the two- or four-leaf stage of canola was more likely to be a risk efficient strategy. The best canola system (GLU, GLY or IMA) varied across sites, highlighting the need for producers to take into account influences of their own area.

