The Canadian wheat industry will rely on a weakening link to international agricultural research centres as key sources of resistance against certain plant diseases, including tan spot, say some agricultural consultants.

Tan spot, a wheat disease of growing economic importance in Canada, provides one example of the country’s reliance on international agricultural research centres (IARCs), says agronomist Neil Thomas.

As the search for resistance against tan spot reveals, links with IARCs have the potential to save Canadian farmers millions of dollars. Tan spot -- also known as yellow leaf spot -- may be costing Canadian wheat farmers an estimated $60 to $70 million a year. Tan spot has become an increasing threat since the introduction of low- and no-till tillage systems. These systems leave stubble on the field, on which tan spot can survive for several years.

The importance of genetic diversity

No commercial wheat variety in Canada shows good resistance to the fungal disease. In the search for tan spot resistance, Canadian breeders must therefore look overseas. One of the principal sources – though not exclusively so – is in Mexico, at a research centre called the International Maize and Wheat Improvement Centre (CIMMYT), says Thomas. The centre is one of 16 IARCs supported by a global association of donors known as the Consultative Group on International Agricultural Research (CGIAR).

While the Canadian wheat industry is one the world’s most stable and successful, "Canada must look to such linkages (with the IARCs) to provide the sources of resistance necessary for wheat to continue as a crop of importance in Western Canada," stated a 1998 study by Thomas. The study, done in collaboration with Agriculture and Agri-Food Canada, identified tan spot as an example of the dependence of Canadian breeders on international centres for access to foreign wheat germplasm "in the search for the all-important resistance genes." Germplasm is the basic genetic material used in plant breeding.
The role of offshore germplasm

Canadian wheat cultivars, in fact, have the lowest genetic diversity of cultivars of any major wheat producing country. And virtually no crop in Canada is developed from indigenous germplasm.

The Canadian wheat industry is highly dependent on offshore germplasm, says agricultural consultant Ralph Cotterill. "Yet most Canadians wouldn’t realize that very little of our germplasm is indigenous to Canada. Virtually all of it has its origins in other parts of the world," he says.

Costs of conservation

Germplasm is shared freely by international scientists, but any germplasm is costly to collect and conserve, says Cotterill. The collections developed and maintained by the IARCs exist only because Canada and other donors support these international centres.

Canada funds international agricultural research through the Canadian International Development Agency (CIDA) and the International Development Research Centre (IDRC). Last year CIDA contributed $16.3 million to the 16 centres of the CGIAR.

Canada receives what are called the "spillover benefits" of this funding. IARCs are funded with the intent of helping breeding programs in other countries. But as a result, Canada greatly benefits from the sharing of germplasm and scientific knowledge flowing from of these international centres.

Resistance to tan spot

One of the benefits of this funding could turn out to be tan spot resistance. It was in his 1998 study that Thomas estimated the spillover benefit to the Canadian wheat industry of tan spot resistance alone could be $60 to $70 million annually.

"It’s a significant amount, if you think about how much money Canada puts in to the IARCs. That sort of unintentional benefit far outweighs what we give to the international agriculture system," he says. Thomas also notes that it may not be until 2010 that such resistance is fully realized.

Canada, unlike Australia and the United States, avoids openly recognizing the spillover benefits of funding international agricultural research, says Thomas. Canada views support to IARCs solely as part of official development assistance (ODA). "Using spillover benefits as a policy objective would muddy the waters considerably at a time when we need to avoid further cuts to our ODA support to the CGIAR," says Thomas.

Research: a two-way street

But Thomas does warn further cuts could spell trouble for Canadian farmers. If access to foreign germplasm was restricted, Canada would have difficulty responding to changing diseases and economic factors, forcing shifts to new crops or new niches for traditional crops, he says.

Germplasm from Mexico’s CIMMYT has already been used to develop the Western wheat class, Canadian Prairie Spring – an important export commodity.
It’s not just a one-way flow, however. Canadian breeders play a significant role in the sharing of genetic material. Canada, for example, has one of the world’s best wheat leaf-rust resistance collections. Canadian material is provided to CIMMYT, and is used worldwide.

Whether or not Canada chooses to openly recognize the benefits of international agricultural research on its own wheat industry, "we should remember that we don’t live in isolation," concludes Thomas. "International collaboration in agricultural science is the only way to ensure the survival of our own agricultural industry."